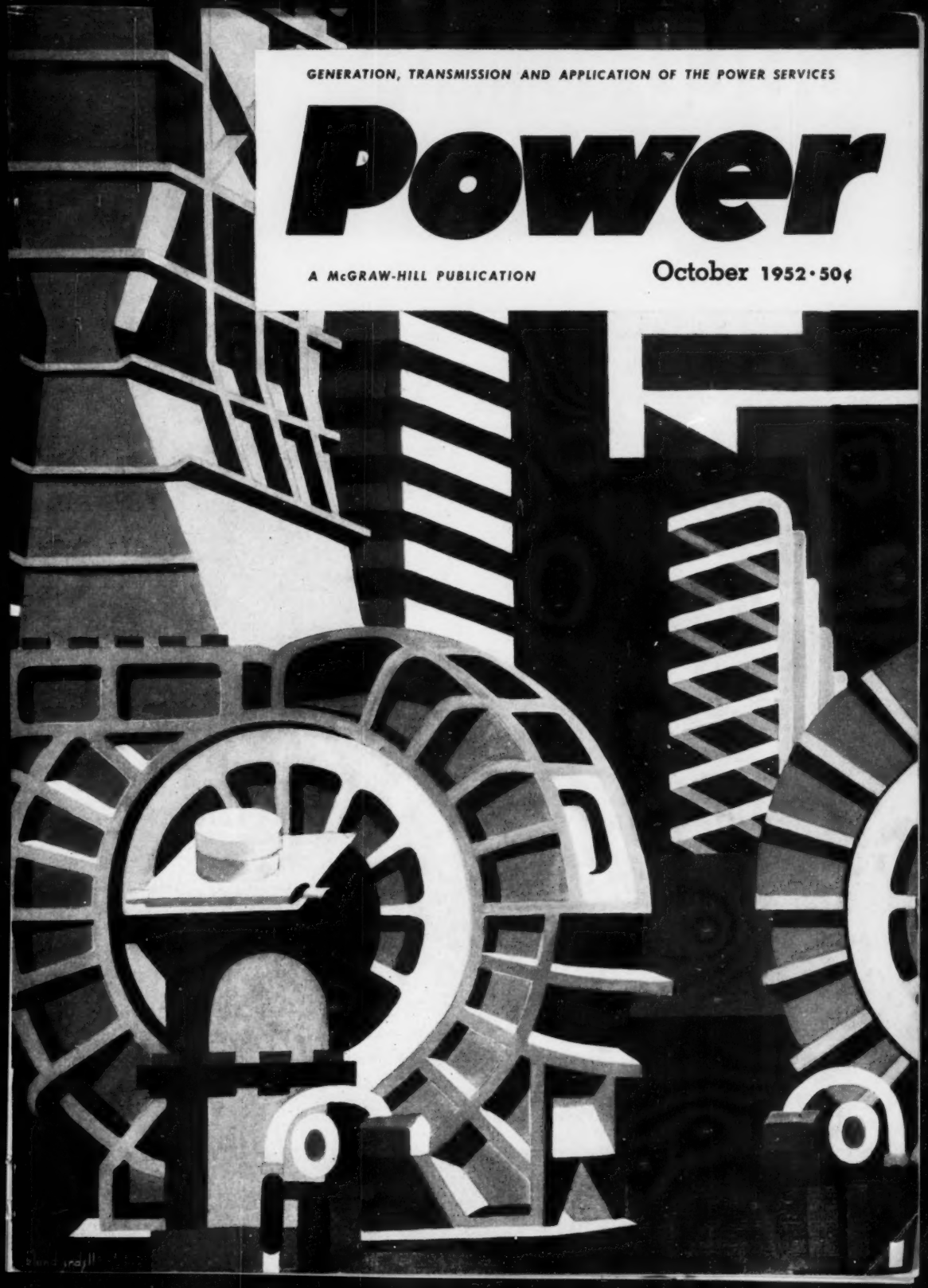
GENERATION, TRANSMISSION AND APPLICATION OF THE POWER SERVICES

Power

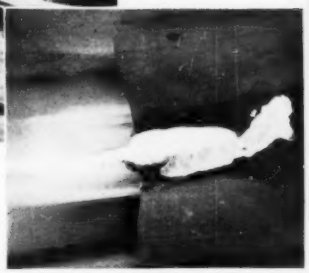
A McGRAW-HILL PUBLICATION

October 1952 · 50¢



COLD climate ...HOT slag

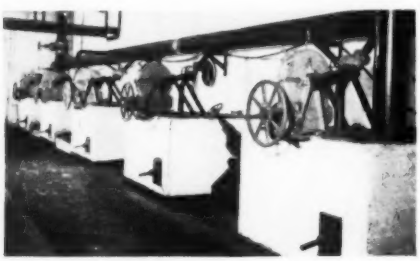
Slag and water discharging into fill area at Bolidens Gruvaktiebolag, Skelleftehamn, Sweden.



Molten slag entering water in granulating chamber. Viewed from above.

This important Swedish copper smelter near the Arctic Circle operates all year long, taking no time out during the many months of subzero weather. Such conditions put equipment to a severe test, and we're proud that the Hydrojet System that takes care of the slag meets the proverbially high standards of Swedish efficiency.

In the operation at Skelleftehamn, two Hydroseal Ash Pumps in series pump a 180°F. mixture of slag and water against a total head of 152 feet. During a normal day approximately 400 tons of granulated slag are delivered to the fill area at a rate of 2000 G.P.M.



Slag granulating chambers.

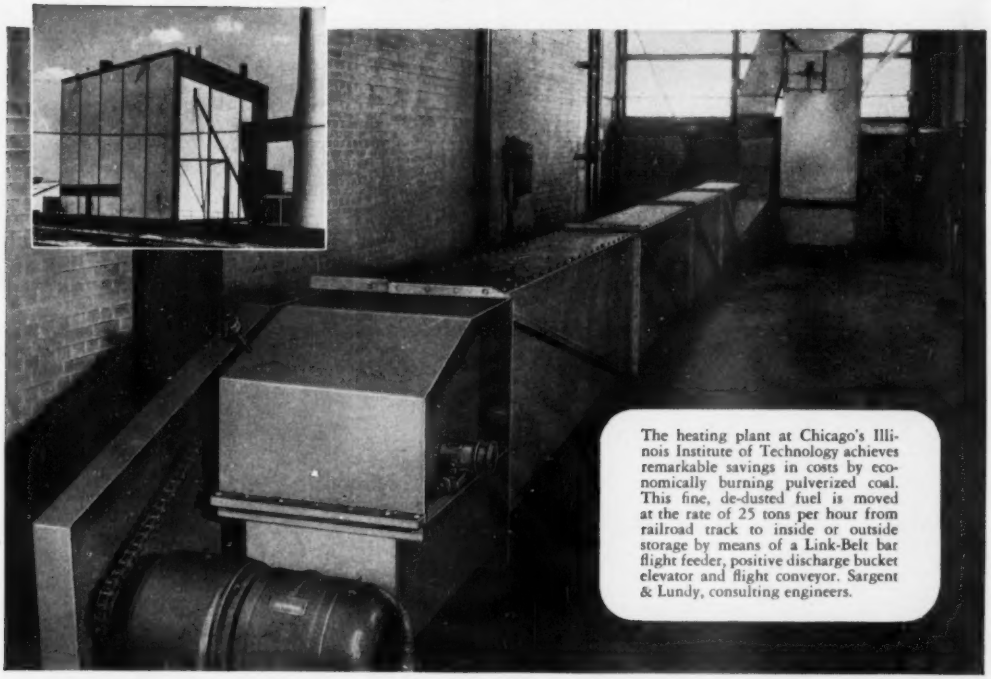
If you have a refuse handling problem, get the advice of your nearest A-S-H engineer. It's the quickest way to find the right answer.

THE ALLEN-SHERMAN-HOFF CO.
Dept. A—259 E. Lancaster Ave., Wynnewood, Pa.
Offices and Representatives in Principal Cities

HYDROJET *(hydraulic)* **HYDROVAC** *(pneumatic)*
materials handling systems

For 1 ton or 2000 tons

of coal per hour...



The heating plant at Chicago's Illinois Institute of Technology achieves remarkable savings in costs by economically burning pulverized coal. This fine, de-dusted fuel is moved at the rate of 25 tons per hour from railroad track to inside or outside storage by means of a Link-Belt bar flight feeder, positive discharge bucket elevator and flight conveyor. Sargent & Lundy, consulting engineers.

LINK-BELT equipment cuts handling costs

NO TWO power plants have identical coal handling requirements. That's why Link-Belt is in a unique position to help you get the most efficient system for your special conditions.

Large or small . . . boat, rail or truck-supplied . . . inside or outside storage — Link-Belt engineers can bring a vast store of experience to focus on your particular problems.

Equally important, Link-Belt builds all types and sizes of unloading and handling machinery. You get the *right* equipment for the job, to fit your needs *exactly*.

Link-Belt can take care of every detail of your coal handling system, from planning through erection. For full information, call the Link-Belt office near you.

Link-Belt equipment for power plants...

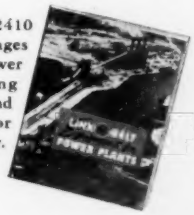
Railroad car dumpers and shakers; coal displacers; receiving hoppers; dock cranes and unloading stations; silo and ground storage systems; coal crushers; dryers; feeders, conveyors and elevators of every type; weigh larries; complete line of chains and mechanical power transmission machinery.

LINK-BELT

COAL HANDLING EQUIPMENT

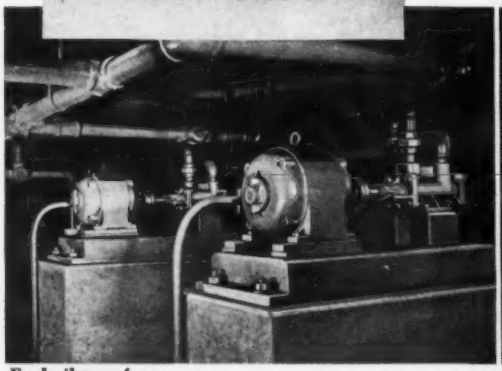
LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,770

New Book 2410 contains 44 pages of typical power plant handling equipment and layouts. Ask for your free copy.

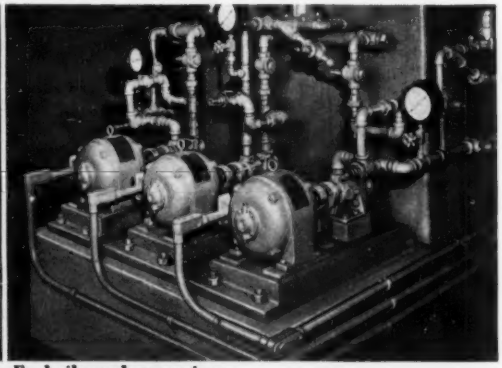


DE LAVAL
IMO PUMPS

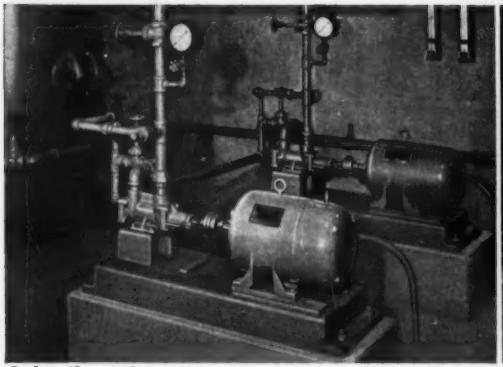
hold down 4 jobs at Owl's Head



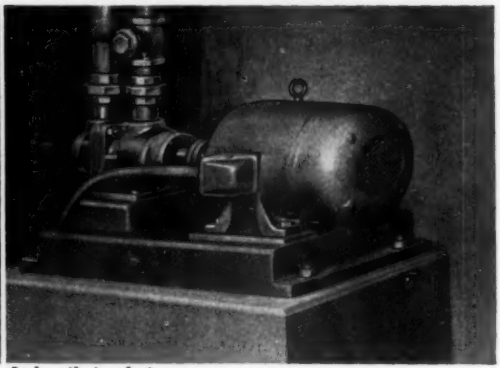
Fuel oil transfer



Fuel oil supply to engines



Lube oil transfer



Lube oil circulating

Again De Laval IMO rotary pumps prove their versatility. Eighteen of them are handling all the fuel and lube oil services for the six National Supply Company dual-fuel engines in the new Owl's Head sewage treatment plant in Brooklyn, New York.

The unique IMO design—*with only three moving parts*—assures long, trouble-free performance. IMO pumps are quiet, pulsation-free, compact and excellent for direct-connected high-speed operation.

Whether your power source is dual-fuel, gas or diesel engine, or oil-fired steam, be sure to specify IMO pumps for your next oil handling job. Use them in high and low pressure fuel oil burner sets, pumping fuel oil to burners, unloading and transferring fuel and diesel oil, handling oil for lighting off service and providing pressure lubrication on pumps and turbines. Send for Bulletin LG showing complete IMO line for capacities to 1,000 gpm at pressures to 500 psi and for capacities to 150 gpm at pressures to 1,500 psi.

DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY
815 Nottingham Way, Trenton 2, New Jersey

DL 197

Power

OCTOBER 1952 • VOLUME 96 NUMBER 10

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POWER articles are indexed in both the *Industrial Arts Index* and the *Engineering Index*. POWER publishes its own annual index, which is available for 50¢ from the editorial offices.

The Red Feather above, in the spot where our miniature cover usually appears, probably made you do a "double take" when you saw it. We hope so, because we want to remind you that October is Red Feather month. Giving generously to your Community Chest, and the funds united with it, aids fellow townsmen who need your help, and contributes to the well-being of the men and women in our armed services.

The striking full-color cover—not reproduced above in miniature—is another painting from Pennsylvania Power & Light Co's collection, "Portrait of Power," about which we told you last March. The artist, John B Erdell, calls this work "Dynamic Rhythms." In its strong patterns he has caught, we feel, the dominant impression given by modern power equipment—tremendous forces held in precise control.

Next month...

■ When an aluminum producer puts up an office building, you'd expect it to hold a hatful of new ideas for using that versatile metal. Alcoa's recently completed structure in Pittsburgh does, particularly in the air-conditioning system, as you'll see in our November report on it.

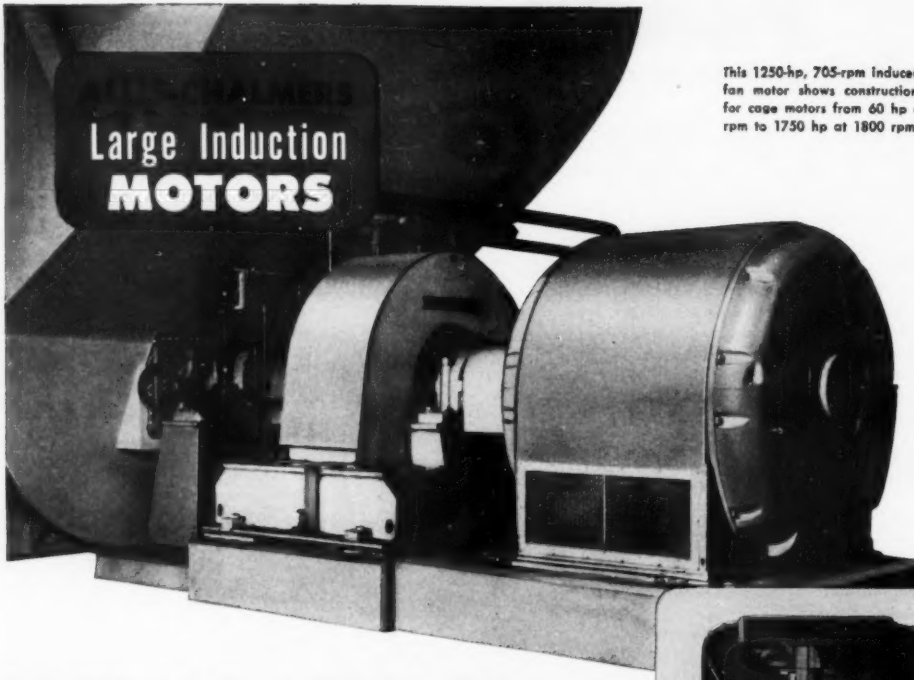
■ There's no mystery to writing a good cooling-tower spec, especially after you've read Raymond Baker's upcoming article. Building on fundamentals, he explains point by point what should be covered if you're to get the best tower for your needs.

■ You can cut costs and speed piping erection by choosing types of joints suited to your field conditions. For the how's and why's, see next month.

■ When A O Smith Corp ran into corrosion troubles in condensate-return lines, they turned to filming amines. The story of their experience includes cost and savings figures.

...and future months

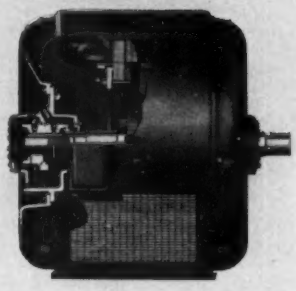
■ Many designers have worked out ways of figuring economic thickness of pipe insulation. We've got one in the works that seems about the easiest yet.



This 1250-hp, 705-rpm induced-draft fan motor shows construction used for cage motors from 60 hp at 300 rpm to 1750 hp at 1800 rpm.

GOOD TO LOOK AT... and Worth Looking Into

THIS MODERN Allis-Chalmers cage motor looks good in modern power plants—one glance at its clean, simple lines and smooth contours tells you that. But only a careful check of its design features can show how much it offers in all-around protection, easy accessibility, and operating dependability.



Cutaway view indicates construction features of this modern motor. For details, ask your A-C representative for Bulletin 05B7542, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

Protection begins with drip-proof construction as standard above 500 rpm. (Splash-proofing entails no change in external appearance.) In addition, louvers on air discharges and design of intakes keep foreign objects out of the motor.

Accessibility starts paying dividends during installation; large stator air discharge openings allow ample room for drilling, doweling and bolting. And they encourage cleaning of air passages back of the stator core. For cleaning or inspecting the windings, only the upper halves of the end shields need be removed — there's no need to disturb the bearings.

Dependability stems from rigid cast-iron end shields that assure maintenance of correct bearing alignment. Capsule-type bearing housings protect the bearings and oil supply while the motor is being cleaned. And other construction details further uphold the reputation for long-life reliability enjoyed by Allis-Chalmers motors. A-3828

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Power

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...with Power readers...

HUMAN AFTER ALL . . .

Let me start by saying that your special report on "Water" was literally a masterpiece — technical information presented clearly and excitingly. I caught just one slip and it proved to me that your editors are human after all. On page 100, under the heading "One River, One Plan, Many Questions," you give the length of the Missouri Valley as 13,000 miles. Surely you mean 1300 miles?

Philadelphia, Pa. J A McDERMOTT

Reader McDermott is right—we did make the Missouri Valley ten times too long. In spite of many proofreadings, by many pairs of eyes, we didn't catch this typographical error until after the section was off the press and it was too late to make a change. We're not only human enough to make mistakes once in a while—we're human enough to have cussed loud and long when we did discover this flaw in what we hoped would be a faultless gem.

We're also human enough to be vastly pleased by the many fine comments we've received, by the numerous orders for reprints. We got a special bang out of the fact that Waldemar Kaempffert, science editor of *The New York Times*, featured our report in his Sunday, Aug 29, column, described it as the most comprehensive and easily read report on the subject he had seen.—ED.

...lines and bylines

H W Dierman

UTILITY MAN means exactly that when it's applied to Harry Dierman, who tells you about the addition to N. Y.'s East River Station (pp 94-98). He began a career in the utility industry with New York Steam Co. immediately after graduation from Newark College of Engineering (BSME—1927). Starting as a test engineer, he was asst research engineer when N. Y. Steam was merged into Con Edison in 1938. In the mechanical engrg dept of the parent company, Harry became an asst engineer and later asst mechanical plant engineer. Then, in 1949, he was assigned to Con Edison's executive development program, and has just completed a 3-year tour covering electric and gas plant operation and maintenance.

Putting his engineering know-how to work in other fields, Harry is now vice-president of the Tenafly, N. J., Board of Health and was instrumental in preparing the new sanitary and plumbing codes recently adopted. He's a member of the ASME Power Test Code Committee on Evaporative Equipment and has written a number of papers on steam-jet-refrigeration design and practice.

E W Winchester

KINDRED SOUL is what we called Eric Winchester when we learned he dislikes TV except for baseball games. That's our stand, too, except we narrow it down to Dodger ball games. On the positive side, Eric likes music and mystery stories, and there we're in exact agreement with him.

Eric acquired this sound outlook on life at Drexel Institute, while absorbing an engineering education (BSCE—1933). He was construction engineer for various Federal agencies to 1939 and then headed projects for five years with W K Mitchell & Co, piping fabricators. Since 1944 he's been with the Kuljian Corp as mechanical designer, project engineer and project manager.

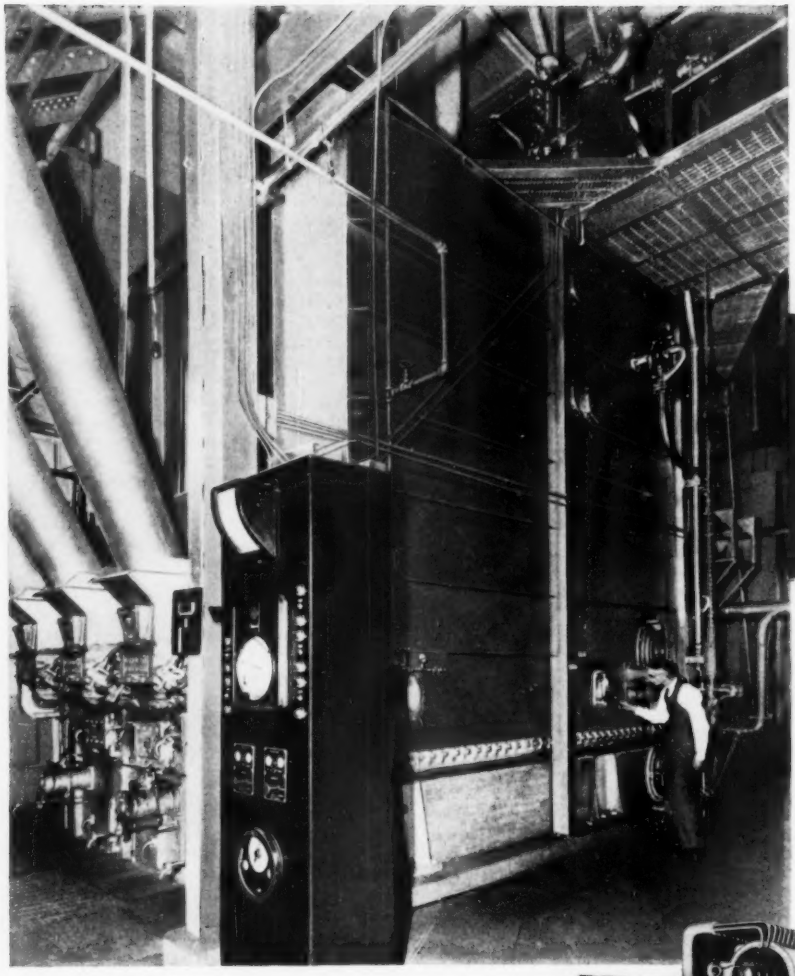
In this issue, Eric collaborates with R M Kinsey of Ehret Magnesia Co to tell you of their power-plant development, in which production of CO_2 from flue gas is an important part (pp 74-77). Right now he's at the Ford River Rouge plant, as construction manager for Kuljian Corp's engineering and construction contracts.

R J Kembel

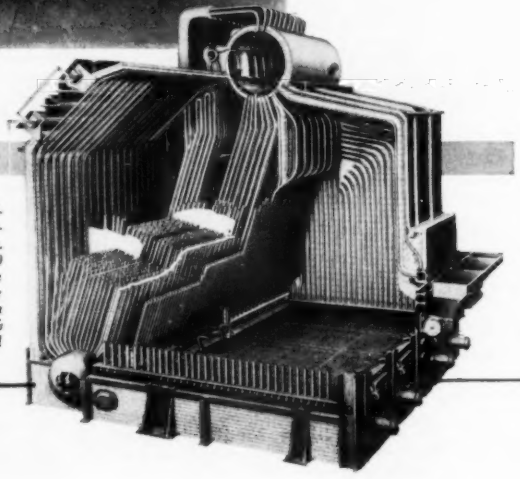
SURFACE SAVING by welding with hardfacing alloys is the growing maintenance art on which Russ Kembel gives you practical pointers in the PO&M section (pp 103-105). Russ speaks with the dual authority of a qualified welder and a trained metallurgist.

A graduate of Penn State's metallurgical extension course, Russ had 15 years of wide experience in the steel industry, during which he qualified as a Navy and insurance welder. As you might guess, he's an active member of the American Welding Society.

While we're basically opposed to nepotism (the fancy word for hiring members of the family), we think you ought to know that Russ is brother-in-law to our own Joe McCabe. It's a small world!



Tom Turner, Chief Engineer of the Buffalo plant of General Mills, Inc. inspects the company's new B&W Integral-Furnace Boiler Type "FJ", after verifying metered records of fuel savings exceeding 15 per cent.



Cutaway view of typical B&W Integral-Furnace Boiler, Type FJ, with stoker firing. Also suited for gas and oil firing. Steam capacity range—30,000 to 70,000 lb per hr at pressures to 800 psi. Design and operating features of this unit are described and illustrated in Bulletin G-70, available from The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

GENERAL MILLS

CUTS FUEL BILL

with B&W Integral-Furnace Boiler

When General Mills, Inc., recently placed in operation a B&W stoker-fired Integral-Furnace Boiler at its Buffalo, N. Y. plant, the company immediately realized fuel savings amounting to more than 15 per cent. The new boiler was installed with no heat traps such as air heaters or economizers, so that the fuel savings are due to better boiler performance alone. Smoke nuisance, long a problem at this General Mills plant, has been eliminated by the new unit . . . to the complete satisfaction of company engineers and local authorities.

The General Mills, Inc. consulting engineers made the plans, B&W men did the entire erection and B&W service engineers moved in to start up the boiler, turning over to General Mills a complete and efficient operating unit. Since that day, the B&W Integral-Furnace Boiler, producing 45,000 lb of steam an hr, has operated continuously, and is destined to give General Mills long service at low cost.

You Can Have These COST SAVING FEATURES

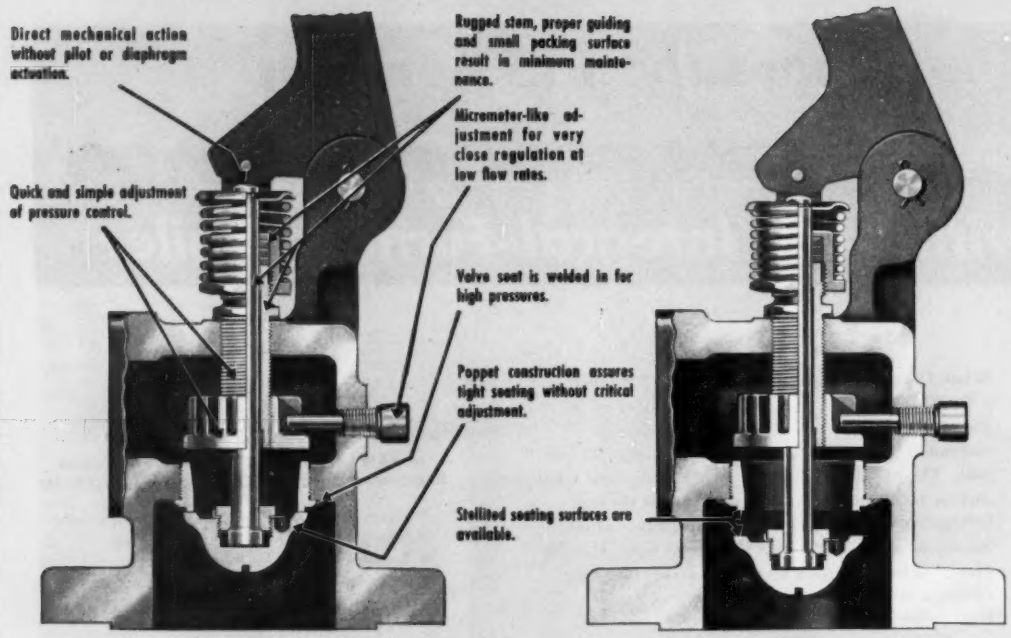
of B&W Integral-Furnace Boilers for Steam Requirements from 2,800 to 350,000 Lb. Per Hr.

- Minimum floor space and headroom requirements
- High fuel economy
- Smokeless combustion
- Adaptable to all fuels and firing methods
- Economical fast steaming
- Water-cooled furnace
- Clean, dry steam at all ratings, even with high boiler water concentration
- Quick response to wide and heavy load swing demands
- Easy to inspect and clean
- High availability with least attention

BABCOCK & WILCOX

G-561

POPPET TYPE VALVES


Direct mechanical action without pilot or diaphragm actuation.
Rugged stem, proper guiding and small packing surface result in minimum maintenance.
Micrometer-like adjustment for very close regulation at low flow rates.
Quick and simple adjustment of pressure control.
Valve seat is welded in for high pressures.
Poppet construction assures tight seating without critical adjustment.
Stellited seating surfaces are available.
CLOSED
OPEN

Demands on a soot blower valve are extremely severe . . . performance requirements very high. Long experience has shown that the poppet type valve is the most satisfactory unlubricated valve for such rugged work. (It is also used in automobile engines.) The Diamond Poppet Type has proved its superiority by many years of successful operation on the most difficult jobs . . . it is an important factor in the outstanding performance of the blowers shown on the opposite page.

Construction assures tight seating without close adjustments. Valve seat is welded in for high pressure service and Stellite seating surfaces are available for conditions that require them. The valve readily lends itself to examination and repair. Disc and seat are quickly accessible, and regrinding can be done quickly without dismounting the head. Seat and disc are forged and the stem rolled from stainless steel.

The integral adjustable pressure control device is used when boiler pressure is higher than desirable for blowing . . . but not so extreme as to require a separate pressure reducing valve. It is easily and quickly adjusted . . . consists of a ribbed disc carried on the threaded valve stem guide. Its location outside the path of valve travel permits full and immediate opening of the poppet valve, thus avoiding wire drawing.

This valve construction is one of the many reasons why Diamond blowers give better boiler cleaning at lower cost.

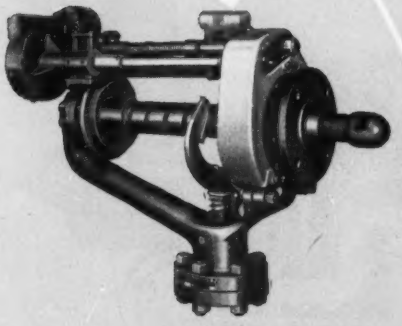
Model IX valve shown above; Models IR and G9B valves have same advantages.

4859

An IMPORTANT REASON for the better performance of

these DIAMOND Blowers

Diamond Model IK Long Retracting Blower with mechanically operated valve. Air motor operated unit shown; also available electric motor operated.



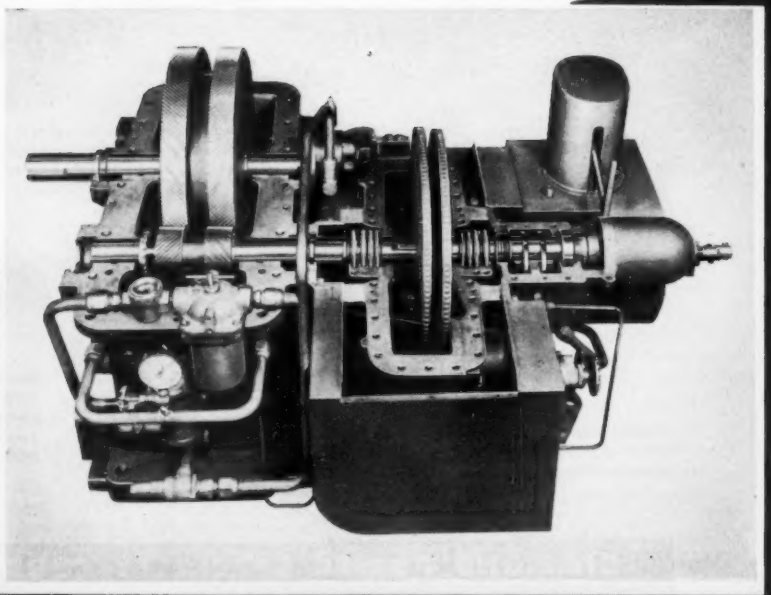
Diamond Model IR Short Retracting Blower with air motor operation; electric or manual operation also available.

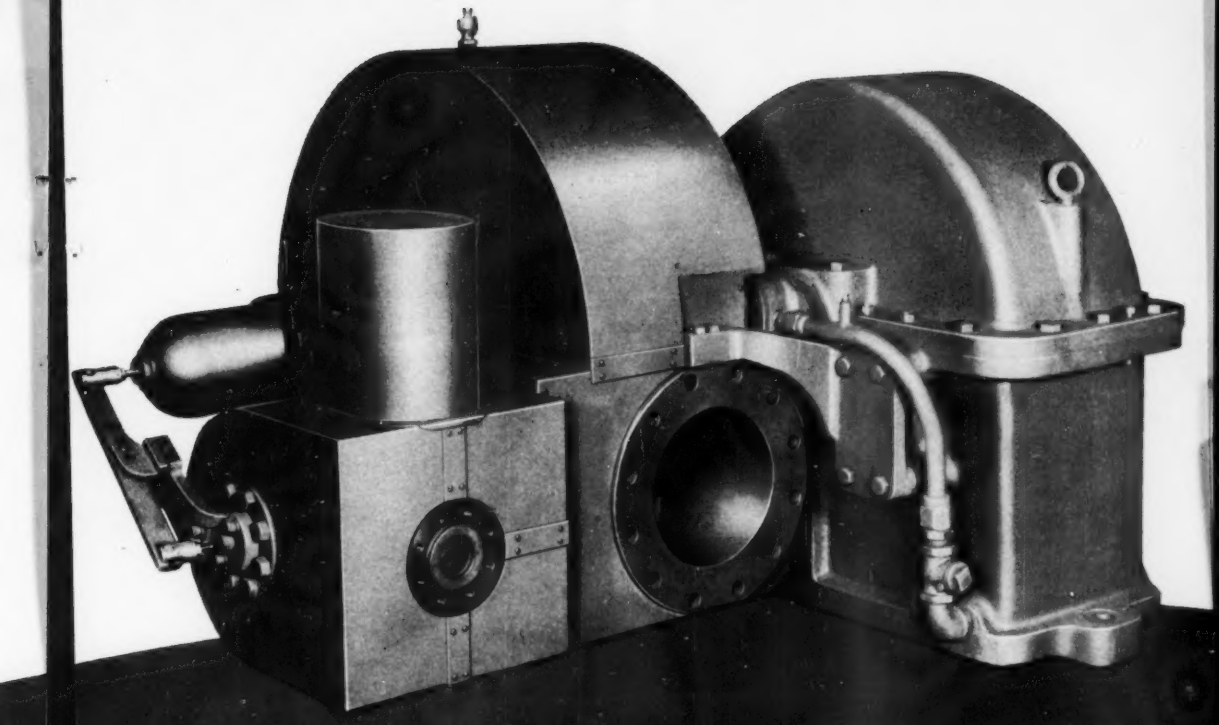
Diamond Model G9B Automatic Valved Blower with electric motor operation; also available with air motor or manual operation.

DIAMOND POWER SPECIALTY CORPORATION
LANCASTER, OHIO
Diamond Specialty Limited • Windsor, Ontario

NEW ELLIOTT Geared Turbine

• The new line of Elliott reduction gears is available in either built-in or coupled designs. *Built-in* units have turbine and gear case firmly secured together, with turbine wheels and pinion mounted on the same sturdy high-speed shaft. Exhaust end turbine bearing and pedestal as well as the high-speed coupling are eliminated. This results in a compact unit of minimum overall length. The *coupled* reduction gear is a separate and self-contained unit, with pinion shaft flexibly coupled to the turbine and gear shaft flexibly coupled to the driven machine.





THE TURBINE

The new "built-in" Elliott geared turbine employs the sturdy and dependable YR turbine. This proved turbine design is adaptable to practically all operating requirements and is economical to build, operation and maintenance.

Outstanding features are centerline support, stainless steel turbine buckets and shroud, dynamically balanced rotors, and the choice of several governors to be used with the standard overspeed governor. The wide use of standardized parts that fit all sizes of YR turbines simplifies maintenance and the stocking of parts.

Full details on the new Elliott Geared Turbines are given in Bulletin H-19, just released. Bulletin H-16 describes the YR turbine line. Contact your local Elliott District office or write Elliott Company, Jeannette, Pennsylvania.

THE GEARS

Gear and pinion are double-helical (herringbone) type, precision-hobbed, ground, and long wearing. Tooth spacing is held to extremely close tolerances. Correct tooth proportioning of the teeth minimizes pinion deflection and permits a uniform, low tooth load.

Both the high and low-speed gear shafts are provided with an oil flinger combined with a special seal. This design prevents leakage of oil from the gear case and also excludes the infiltration of water, steam, or impurities into the gear case.

All ELLIOTT gears, built as a complete, include a self-contained, forced-feed lubrication system which circulates oil under pressure to both gear and turbine bearings. In addition, two spray nozzles in the top of the gearcasing direct a flow of oil continuously into the meshing point of the gear and pinion teeth, cooling the teeth and lubricating the driving gear.

ELLIOTT COMPANY

STEAM TURBINE DEPT.

Ask Yourself:

1 ***Do we have hand operations that could be mechanized?***

2 ***Is inferior mechanization hampering any operation?***

3 ***Can we use a greater degree of automatic control?***

4 ***Could we combine several operations into a continuous process?***

If your answer is yes, then you are not producing as fast and efficiently as you can

. . . and the immediate importance of your answer is this: from now on, your success as a manufacturer will depend more and more upon the degree of mechanization in your plant.

Too often, today, advances in mechanization are confined to breaking a production bottleneck, or matching a competitive process.

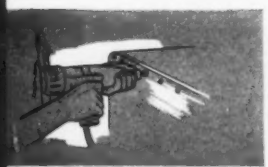
Let's look a bit further—at replacing these sporadic improvements with a *planned* mechanization program.

The results are cumulative. Progressively, each operation is lifted to a higher level of mechanization on a sound economic schedule.

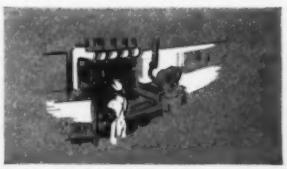
You are insured against tomorrow's competition. Manpower and scarce materials are conserved. Your profit position is strengthened.

To help you plan your mechanization, General Electric offers a new guide. We call it "Progressive Mechanization." It's a "More Power to America" program—another way to increase industrial productivity by spreading the knowledge of modern industrial techniques.

HERE ARE THE FOUR STAGES OF PROGRESSIVE MECHANIZATION



1 Simple Mechanization—simple machines driven by power—like this electric tool.

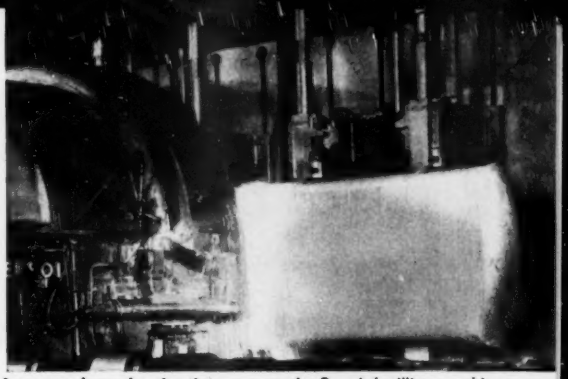


2 Improved Mechanization—more complex, like this drilling machine. Motors and controls aid manual operations.

3 Automatic Control—machines that have adjustable-speed with "push-button control," like an automatic welder.

4 Continuous Process—machines co-ordinated for "start-to-finish" production.

Simple mechanization—example: Lightweight electric impact tool tightens nuts in 1/10 the time a hand wrench takes.



Improved mechanization—example: Special milling machine replaces lighter type—"scalps" aluminum billets 5′ wide 10′ long.

Automatic control—example: Adjustable-speed beer-can filling machine will change rate of production to meet any condition.

Continuous process—example: 216 operations are made on cylinder block in 36 seconds by automatic-transfer-type machine.

How you can improve production in your plant with the G-E Progressive Mechanization Program

START OFF with a "launching ceremony"—have all of your engineers and key people see the full-color movie "Motors in Industry." You'll drive home to them the importance of improving mechanization in your plant.

This informative film has more than 40 interesting mechanization case histories. Shots from four of them are pictured above. They are just a few of the examples that you can use to stimulate interest in mechanizing *progressively*.

CHANNEL THIS INTEREST—do some practical, organized probing into your present production methods. General Electric's Progressive Mechanization manual may help show you the way. Hand out the special mechanization survey forms. You can use them to enlist the participation of as many persons as you wish, including the men "at the bench."

WANT TO LEARN MORE? You get a free copy of the Progressive Mechanization manual, and indicate interest in seeing "Motors in Industry," just by sending in the coupon below. Or contact your nearest G-E Apparatus Sales Office.

GENERAL ELECTRIC

Back up your Mechanization Program with the G-E Motor Selection Course

Here's a complete course, covering the fundamentals of motors now available. It explains how to select and supply motors, what sort of control to use. Your local G-E representative can make arrangements for you to use this course.

MORE POWER TO AMERICA programs are guides to increase the efficiency of American Industry. They stimulate wider, more efficient use of electricity in production.

Section N752-14
General Electric Co., Schenectady 5, N. Y.

I'd like to learn more about the new G-E Progressive Mechanization program.
I'm interested in:

- ☐ **A free copy of the Progressive Mechanization manual.**
- ☐ **Seeing the motion picture on Progressive Mechanization.**
- ☐ **Using the "Motor Selection & Application Course."**

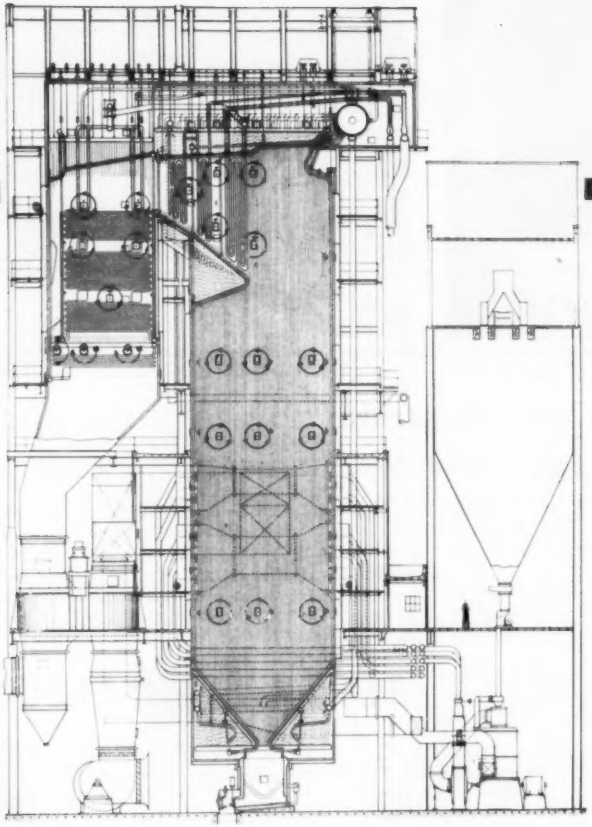
Name ..... **Title** .....

Company .....

Address .....

IT'S VULCAN

LARGEST



Boilers.....4 Radiant Type; Combustion Engineering—Superheater, Inc

Capacity, each..... 1,250,000 lb per hr

Operating Pressure....1925 psi

Total Steam Temperature, 1055 F

Fired by.....Pulverized Coal

Soot Blowing, per boiler, Vulcan Automatic-Sequential System includes wall blowers; long retracts for reheater and superheater sections; rotaries, for economizer; air-heater-cleaner controls; all driven by air. Blowing medium—air.

Consulting Engineers....Ebasco Services, Incorporated

VULCAN *Automatic*

for ELECTRIC ENERGY, INC.
JOPPA STATION

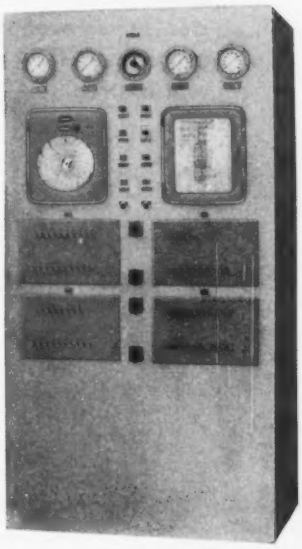
Electric Energy, Inc. was formed by the following utility companies:
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
ILLINOIS POWER COMPANY
KENTUCKY UTILITIES COMPANY
MIDDLE SOUTH UTILITIES, Inc.
UNION ELECTRIC CO. OF MISSOURI

SOOT BLOWER ORDER EVER PLACED for a single central station . . .

At Joppa Station—first station in the world designed for initial capacity of 650,000 kilowatts—boiler cleaning will be by Vulcan. The Vulcan automatic-sequential system for this station represents the largest single central station order ever placed for soot blowers.

Each of the four Combustion boilers ranks with the largest ever built. At full capacity they will burn 7500 tons of coal every 24 hours. Boiler cleaning will be critical, for high boiler availability will be at a premium at Joppa Station, which will play a major role in our national defense program.

Vulcan offers effective cleaning, with minimum maintenance—for large boilers or small—utility or industrial—power or process. A letter will bring you facts on how Vulcan can save for you.

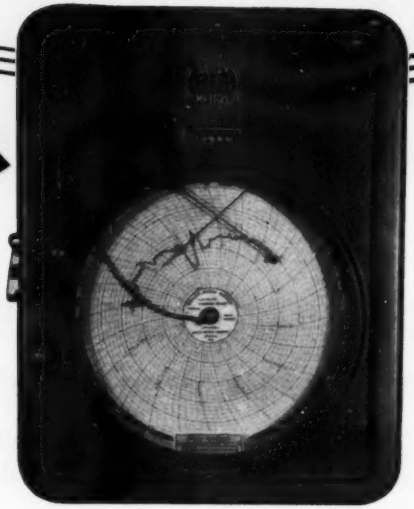


Without leaving this panel, an operator can start the blowing cycle for a boiler, observe the proper operation of each blower, see it shut off automatically when the cycle is complete. He can also cut one or more blowers out of the sequence, or repeat operation of any blower, depending on cleaning needs.

COPES-VULCAN DIVISION
CONTINENTAL FOUNDRY & MACHINE COMPANY
ERIE, PENNSYLVANIA

To Answer Your

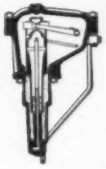
LOOK HERE



This standard Bailey Recorder actuated by mechanical, electrical, or pneumatic transmission solves even your toughest problems in flow measurement and control.

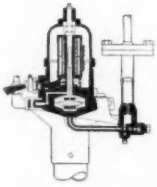
YOUR Choice of 7 Measuring Components:

...To measure steam, liquids, or high pressure gases in pipes use:



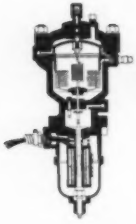
1 Ledoux Bell—

This shaped bell floating in mercury insures high accuracy and dependability throughout entire meter range. Records on uniformly graduated chart. For static pressures up to 2500 psig.



2 Mercury Float—

Actuates electric transmitter which has interchangeable range tubes. Electronic receiver records on uniformly graduated chart. For static pressures up to 2500 psig.



3 Bellows—

Actuates electric transmitter which requires no mercury, is readily portable and is easily adjustable to a wide variety of ranges. Electronic receiver records on uniformly graduated chart. For static pressures up to 3500 psig.

Bailey Meter Company

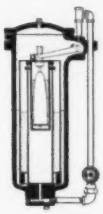
Flow Problems

...To measure liquids in pipes use:

4 Area Meter—

Variable area constant differential orifice actuates electric transmitter. For 1, 2 or 4″ lines in capacities from 1200 to 96,000 lb per hour and static pressures up to 600 psig.

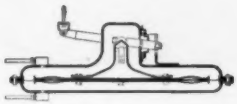
...To measure low pressure gases in pipes and ducts use:



5 Inverted Bell—

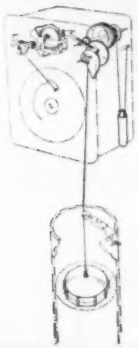
Sizes up to 12″ diameter furnish ample power with differentials as low as 2″ H_2O. Shaped displacer floating in mercury provides for uniformly graduated chart. Static pressure limits vary from 50 to 800 psig, depending upon bell size.

6 Diaphragm—



44 square inches in area opposed by shaped displacer floating in mercury actuates uniformly graduated chart recorder. Suitable for differentials from .5″ to 7″ H_2O and static pressures up to 70″ H_2O.

...To measure liquids in open channels use:



7 Open Float—

Actuates uniformly graduated chart recorder through pulley-operated cam and gear train. May be calibrated to any maximum head between 5″ and 360″ of liquid flowing in channel.

•

Ask your local Bailey Engineer to assist you in applying Bailey Meters to your measurement and control problems.

C-8

1036 Ivanhoe Road
CLEVELAND 10, OHIO

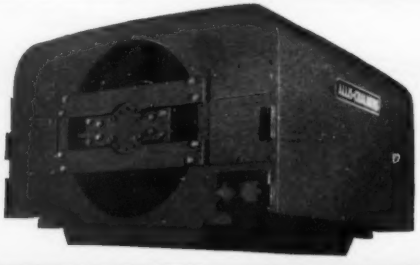
Meters and Controls For Power and Process

WA-Series

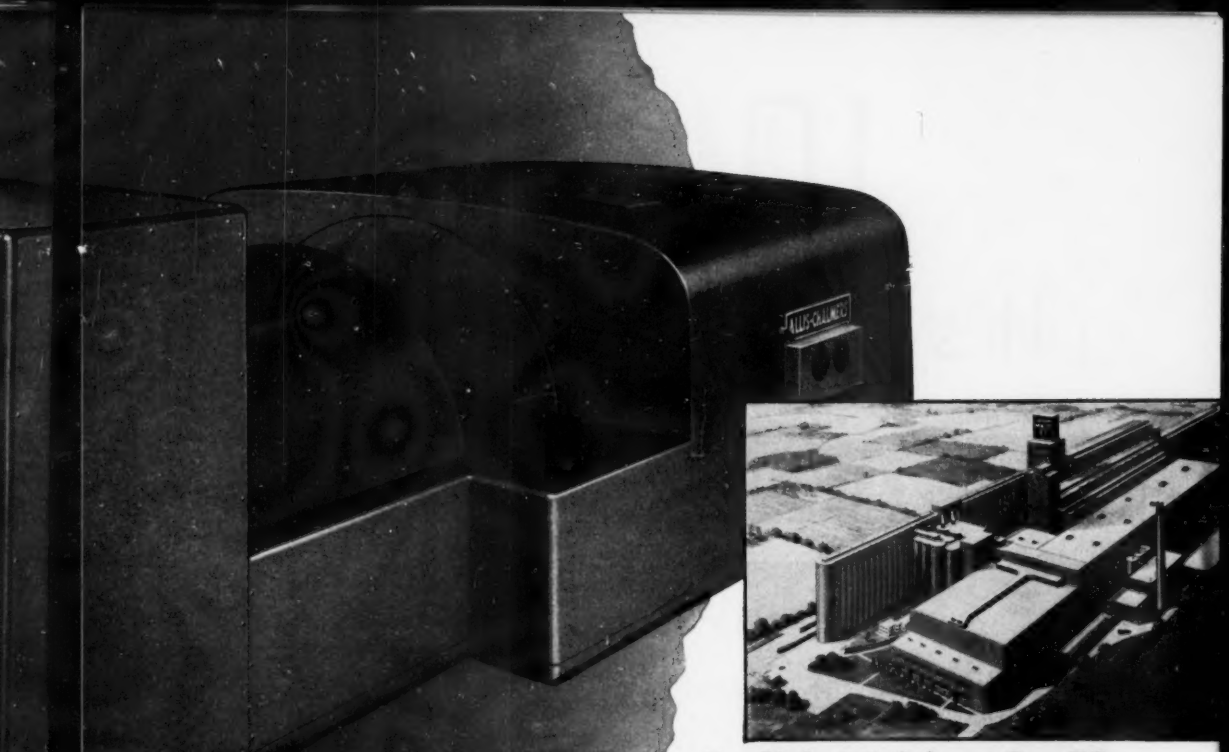
STEAM TURBINE GENERATOR UNIT

Doing Double

AT ONE OF WORLD'S LARGEST MALT



SIMPLIFYING INSTALLATION, both turbine and generator (shown at left) are shipped as complete assemblies with the rotors locked in place. The WA-Series generator is of the housing type with air-coolers mounted in the stator above the floor lines, eliminating special coolers and duct work.



Ladish Malting Co. Uses Steam for both Processing and Power Generation

Duty

HOUSES!

GREAT QUANTITIES OF STEAM are required in the process of manufacturing 10 million bushels of malt annually at the Ladish Malting Co., Jefferson Junction, Wisconsin. And, as an economic by-product, the electric power needed for plant operation is generated by the same steam.

When this world's largest single unit malt house recently needed more generating capacity, Allis-Chalmers again was chosen. And with good reason, since two Allis-Chalmers units had been supplying the electric power consumed at the Ladish Malting Company for nearly fifteen years.

Installed in 1951, the modern 2500 kw WA-Series unit shown here is now on 24 hr a day, 7 day a week duty. It consists of a non-condensing impulse steam turbine and housing type air-cooled generator and exciter . . . carefully engineered and manufactured to operate as an integrated unit.

Built for condensing or non-condensing service in NEMA ratings through 7500 kw, a modern WA-Series unit also will enable *your* power plant to meet tomorrow's expanded power demand. Complete details contained in new Bulletin 03B7654. For your copy, just call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis.

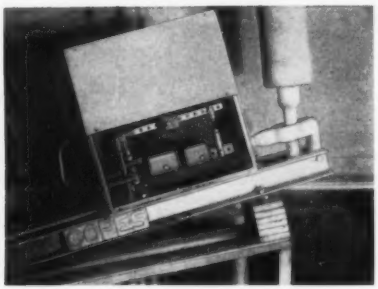
A-3601

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

it's 10 years for

ON AMERICA'S FIRST 1935 PSI, 960 F



Water-level element of the Flowmatic Regulator is a COPES Thermostat.

SIGNIFICANT DATA

Boiler. . . **Controlled-circulation, Combustion Engineering-Superheater, Inc**

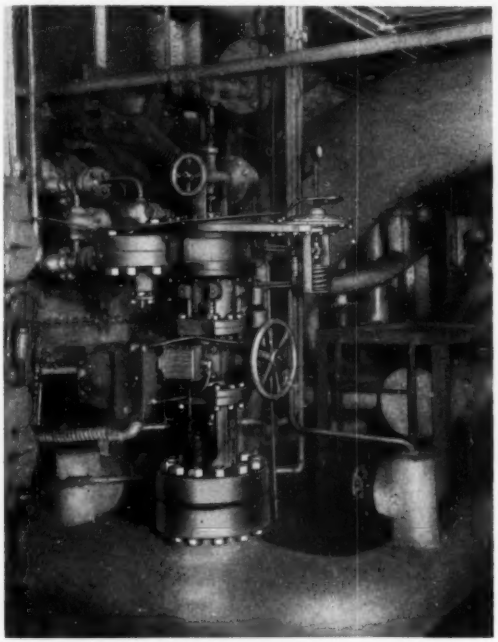
Capacity. . . . . **650,000 lb per hr**

Superheater outlet conditions
. . . . . **1935 psi and 960 F**

Firing. . . . . **Pulverized coal or oil; tangential corner firing**

Feed pumps. . . **3, each with normal capacity of 325,000 lb per hr; discharge pressure**. . . . . **2200 psi**

Engineers. . . . . **Stone & Webster Engineering Corporation**



One of the two COPES Flowmatic Valves feeding the controlled-circulation boiler.

COPES

BOILER FEED

Copes at Montaup

CONTROLLED CIRCULATION BOILER

boiler water level control

master excess pressure control...
recirculation on light load...

Ten years ago—in October, 1942—America's first large controlled-circulation boiler went into service at Somerset Station of Montaup Electric Company. COPES provided the feed water control for this pioneer installation.

The COPES system begins with master excess pressure control at the boiler feed pumps. It includes COPES Flowmatic Regulators—one in each of the two feed lines—responding to the combined influences of rate of steam flow and boiler water level. It provides automatic recirculation to protect the feed pumps on light loads.

Ten years of dependable performance—handling emergencies as easily as routine operation—prove the soundness of COPES engineering and the durability of COPES equipment.

The engineers who pioneered this outstanding feed-control installation can solve your toughest job—with complete independence from other instruments and controls.

COPES-VULCAN DIVISION

CONTINENTAL FOUNDRY & MACHINE COMPANY

ERIE, PENNSYLVANIA

WATER REGULATION

HIGH FUEL COSTS SHOULD BE INVESTIGATED!

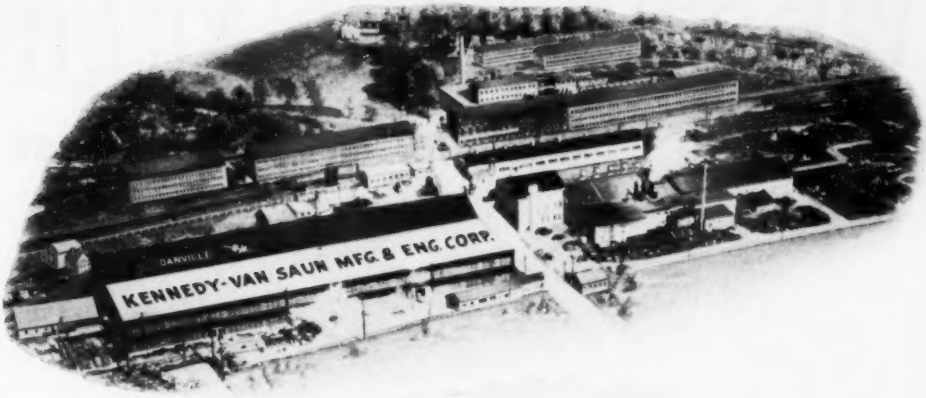
Perhaps your plant would benefit..

In these days of high operating costs an engineering plan that will *increase* production and *lower* overhead is well worth serious consideration.

Investigate your coal bill. If the results show any or all of the following conditions, unnecessary waste may exist. *Check these important questions:*

- WHAT IS YOUR UNBURNED CARBON LOSS?
- DO YOU PAY PREMIUM PRICES FOR COAL?
- WHAT IS YOUR BOILER EFFICIENCY AT REDUCED RATING?
- DO YOU LOSE COAL WHEN YOU CHANGE RATING?
- HOW OFTEN DO YOU SHUT DOWN FOR REPAIRS?
- CAN YOU AFFORD FREQUENT STOPPAGES?
- WILL TRAMP IRON IN COAL DAMAGE YOUR PULVERIZER?
- WHAT IS THE MAINTENANCE COST ON YOUR COAL FIRING EQUIPMENT?

Consult our engineering department on your fuel and power requirements!



KENNEDY-VAN SAUN MFG. & ENG. CORPORATION
Danville, Pa. • Fourteen modern, steel and glass buildings with an aggregate floor area of over twenty acres.

..if the facts were known!

NOW . . . investigate existing KVS installations **where all of the above conditions have been met and overcome by KVS engineers.**

Learn for yourself **how KVS Pulverizers permit other plants to effect important savings in their coal and maintenance costs, PLUS increasing their efficiency!**

KVS engineers are at your service **in designing the most efficient type of Power Generating Equipment . . . Steam Generators . . . Pulverized Coal Firing Equipment.**

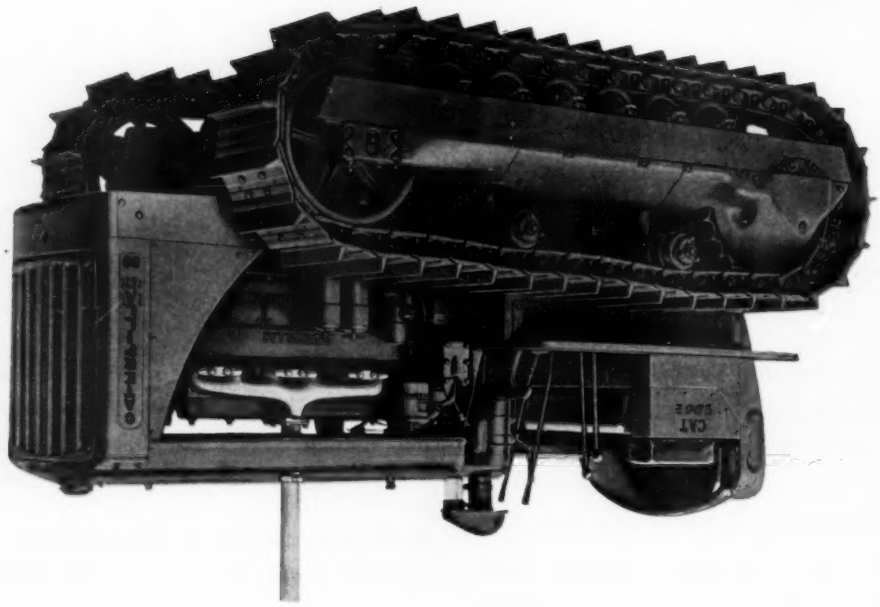
Let us show you how to lower **your fuel and operating costs. The larger profits that accrue will prove that "It Costs Less To Own The Best".**

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY - VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
FACTORY **DANVILLE, PA.**

WE TURNED A TRAC

to make the feeder that



WHEN CATERPILLAR TRACTOR CO., Peoria, Ill., recently installed two* Perfect Spread Stokers at its Joliet plant it had a very special reason for confidence. The same high traction principle that has been basic to Caterpillar's own success and leadership is employed in the AE conveyor feeder . . . and this principle assures 100% uniformity of spread; *absolutely prevents clogging on wet coal!*

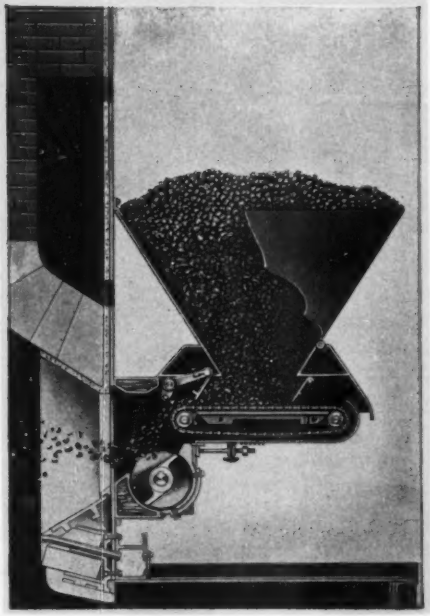
You can get Perfect Spread Stokers in a wide choice of sizes, capacities and grate types . . . but when it comes to the feeder there is only *one* choice. Every Perfect Spread Stoker is equipped with American Engineering's exclusive conveyor feeder . . . the feeder whose superiority is universally recognized and which assures true, *continuous* feeding whether operating at only 50 lbs. of coal per hour or at top capacity.

For most steam per fuel dollar, mail coupon on next page . . . today!

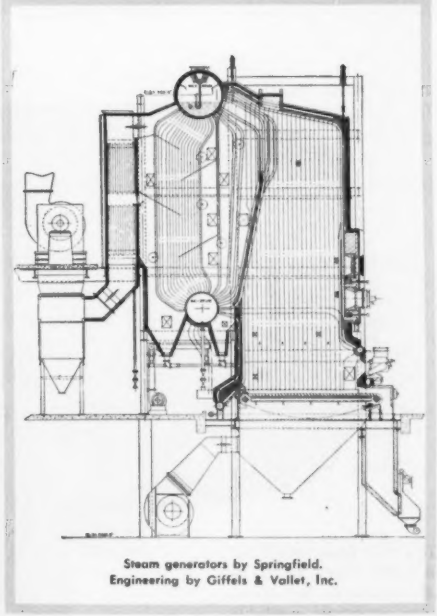
***A THIRD UNIT HAS BEEN ORDERED AND IS NOW BEING ENGINEERED.**

TOR UPSIDE DOWN

won't clog on wet coal



On Perfect Spread Stoker's traveling conveyor feeder a special mechanism drives feeder through a widely adjustable speed range — smoothly and continuously . . . Feeder unit protected against furnace temperatures by water and air cooling around furnace opening and rotor bearings . . . Special high-capacity spiral overthrow rotor distributes coal evenly over the entire grate surface . . . AE reinjection system features visible feed ejector hoppers, ejectors and nozzles of alloy iron. Complete reinjection unit serves every cinder drain point.



Steam generators by Springfield.
Engineering by Giffels & Vallet, Inc.

Cross section drawing showing arrangement of boiler components and some of the principal auxiliaries of the Perfect Spread Stoker installations at the Joliet plant of Caterpillar Tractor Co. The two boilers are designed to operate at 80,000 lbs. per hour continuously, with a peak rating of 90,000 lbs. per hour for a two-hour period. Stokers are 12' wide by 14' 3" long, center to center sprockets. Each stoker has three feeders; 171 sq. ft. total grate area with 150 sq. ft. active area; and each is operated by a 1½ hp. 1800 r.p.m. electric motor.

AMERICAN ENGINEERING
COMPANY
PHILADELPHIA 25, PENNA.

AE Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

American Engineering Company
2400 Aramingo Ave., Philadelphia, Penna.

Gentlemen: — We are interested in getting top efficiency from both low and high ash coals. Please send us full information about Perfect Spread Stokers.

☐ Also send us complete story of *Caterpillar Installation.*

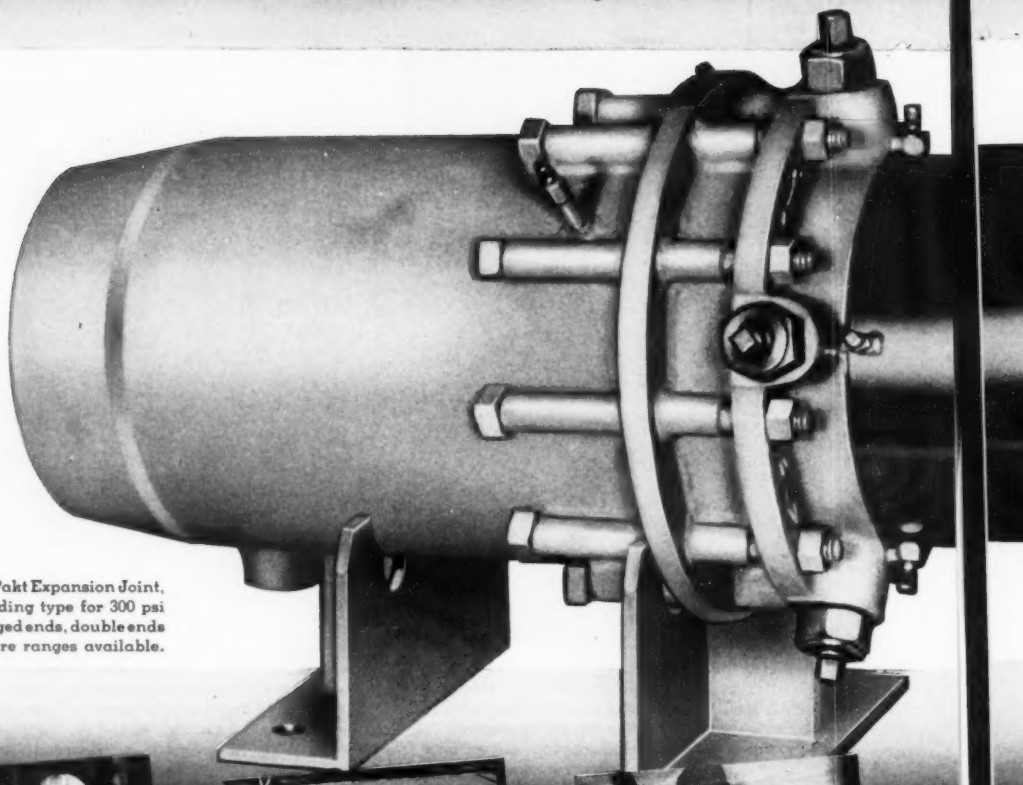
Name..... Title.....

Company .....

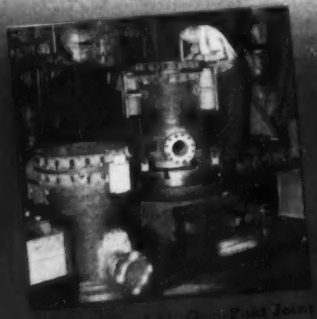
Address .....

City ..... Zone..... State.....

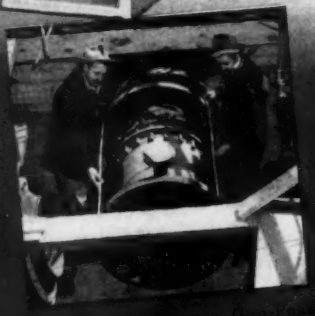
PHILADELPHIA ELECTRIC
GUN-PAKT EXPANSION JOINTS for



Yarway Gun-Pakt Expansion Joint, single end welding type for 300 psi pressure. Flanged ends, double ends and all pressure ranges available.



Testing base of 21" Gun-Pakt Joint for Philadelphia Electric Co. in Yarway factory.

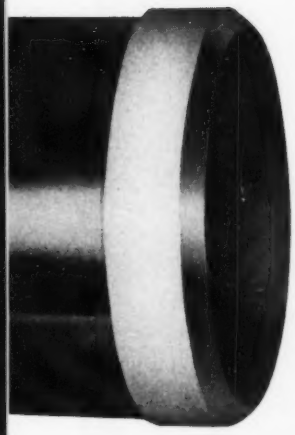


Installing 24" Yarway Gun-Pakt Joint in Philadelphia Electric system at 1 steam line.

Adjusting 24" line in Yarway Gun-Pakt Joint at Philadelphia Electric system.

YARWAY

relies on
24" UNDERGROUND STEAM LINE

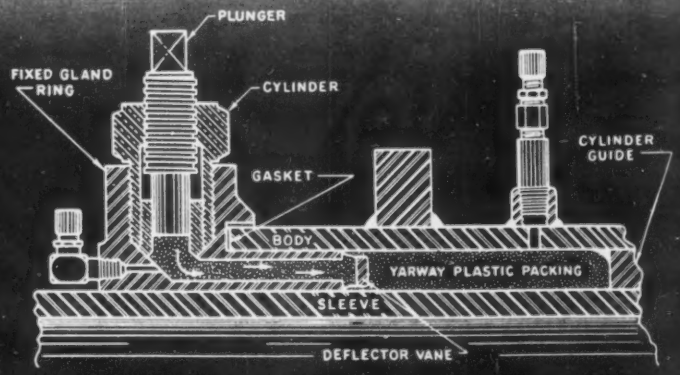


Philadelphia Electric Co. is one of many utilities, institutions and industrial plants who rely on Yarway Gun-Pakt Expansion Joints for steam distribution lines. As an example, twenty-four large 24" Gun-Pakt Joints are helping maintain PE's reputation for reliability, on their new 24" steam distribution line. Gun-Pakt Joints frequently are selected because of the following features.

- **HIGH FACTOR OF SAFETY.** Gun-Pakt Joints are rugged joints—strong and dependable.
- **LOW MAINTENANCE.** No need for shutdowns, because Gun-Pakt Joints are *serviced under full steam pressure.*
- **FEWER JOINTS NEEDED.** Each sliding sleeve may have a 4", 8", or 12" traverse—maximum expansion 24" for a double-end joint. Fewer needed in given length of line.

For the full story on these and other Gun-Pakt Expansion Joint features (like service outlets right on the joint) write for Yarway Catalog EJ-1912.

YARNALL-WARING COMPANY
100 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities



GUN-PAKT EXPANSION JOINT

"WE SAVE $9,000 A YEAR—

"NEW COAL INSTALLATION SAVES US 31.9%—43¢—ON EVERY THOUSAND POUNDS OF STEAM!"

says Mr. Robert W. Paul, Heating Engineer, the University of Akron, Akron, Ohio.

This architect's drawing shows the University of Akron's new steam plant. It is located in a residential neighborhood and operates well within the bounds of extremely tight smoke and dust regulations. The plant burns about 1,450 tons of *bituminous* coal a year, has a steam capacity of 28,000 lbs. per hour. For about $26,000 a year, this new plant does the work that would have cost $35,000 under the old one.

Planning to modernize? Building a new plant? In either case an up-to-date coal installation can save you lots of money!

Labor costs are cut to a minimum with modern coal- and ash-handling systems. And modern combustion equipment gives you more steam for every dollar—10 to 40% more power from every ton of coal!

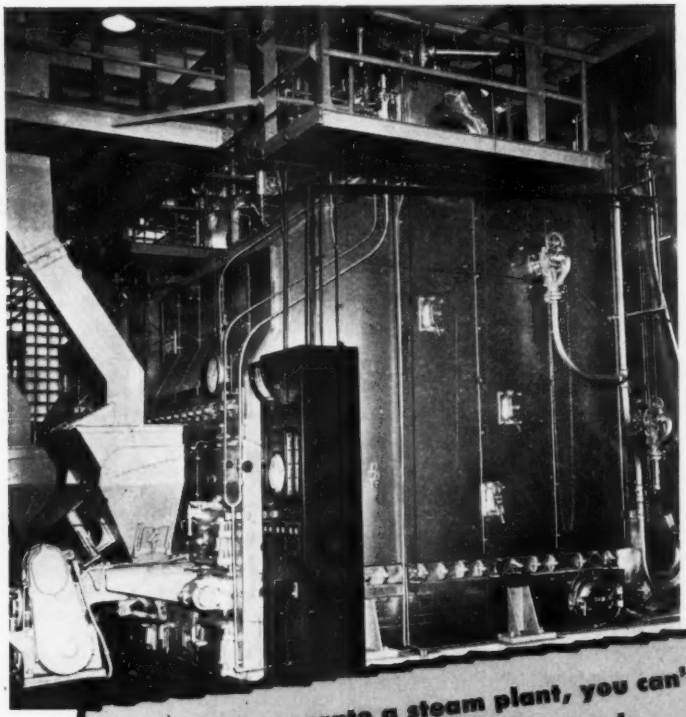
A consulting engineer can show you how these savings really mount up—and mount up fast—when you burn coal in a modern plant designed to meet your *specific* needs.

And coal's your best bet for the future, too. Of all fuels, coal alone has virtually unlimited reserves. And America's coal is mined by the most productive and efficient coal industry in the world. That's why coal offers greater price stability and more dependable supply than any other fuel!

BITUMINOUS COAL INSTITUTE
A DEPARTMENT OF NATIONAL COAL ASSOCIATION
WASHINGTON, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

AND HEAT MORE SPACE—BY BURNING COAL THE MODERN WAY!"



NO SMOKE CONDITION... NO DUST NUISANCE— THANKS TO BURNING AND HANDLING COAL WITH UP-TO-DATE EQUIPMENT!

This view shows Akron's two new stoker-fired boilers. Coal is delivered by truck through a hopper and into a dust-tight room. Ashes are removed pneumatically. The old equipment delivered a thousand pounds of steam at a cost of $1.35. This new installation has cut this cost nearly ⅓. Now Akron gets a thousand pounds of steam for only 92 cents!

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—for hundreds of years to come.

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

YOU CAN COUNT ON COAL!

STEAM POWER for Kaiser

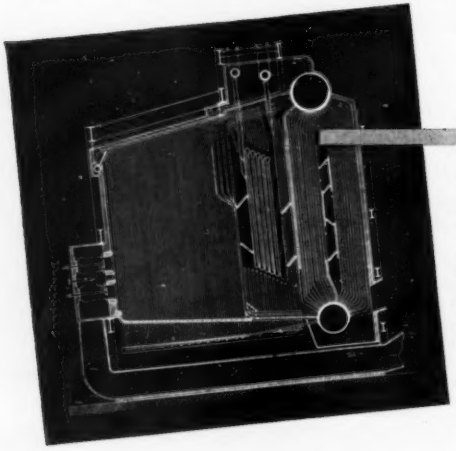
15 FOSTER WHEELER STEAM GENERATORS SERVE THE SOUTH'S BIG NEW

For every pound of aluminum produced in this new 400,000,000 pound-per-year plant, Kaiser will need about 10 kwh of electric power.

To meet this enormous, almost constant demand, Kaiser Engineers selected a plant consisting of gas-burning radial engines, and 15 Foster Wheeler "D" type boilers to supply steam for the turbine-generators.

These boilers, with a combined capacity of 3,375,000 lb of steam per hr, are ideally suited to Kaiser's requirements for reliability, ease of operation and high availability. And they are a natural for use in the South where a temperate climate permits low-cost, semi-outdoor-type installations.

This installation is another example of Foster Wheeler's ability to design and construct power-producing equipment to meet the needs of industry.



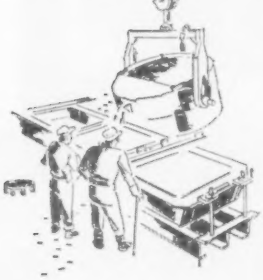
Cross-section of one of the 15 duplicate Foster Wheeler "D" type steam generators for Kaiser Aluminum. The regenerative air heater is not shown.

CAPACITY	225,000 lb per hr
PRESSURE	900 psig
FINAL STEAM TEMPERATURE	905 F
TEMPERATURE FEEDWATER INLET	350 F
FIRING	Natural Gas

For information on your steam generation

Aluminum

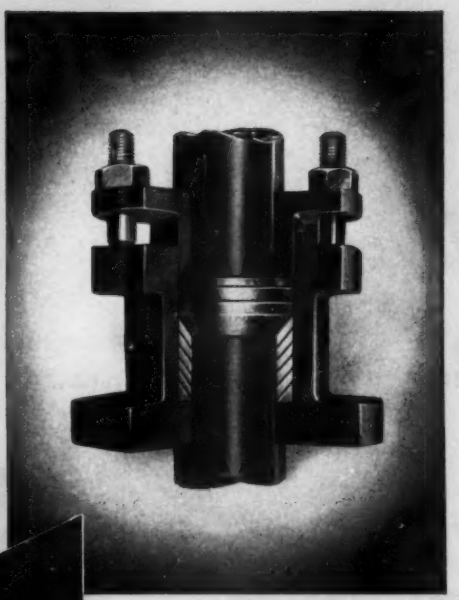
INDUSTRY AT CHALMETTE, LA.



Aerial view showing first six boilers and six of the eight stacks under construction. Nine more boilers, now being fabricated, will be located in extension of the present line. Turbine room is to the left.

requirements, write to: FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, NEW YORK

FOSTER WHEELER



ankor-nest rings

self-setting, they are very valuable in withstanding variable gland pressures

Ankor-Nest Rings consist of several thin, conical shaped rings, die formed to accurate inside and outside diameters, each ring formed to a 45 degree bevel, permitting them to nest against each other inside the packing space. Laying at just the right angle, Ankor-Nest depends on the pressure to hold it to the rod, creating at the same time a fairly constant friction.

Ankor-Nest Rings are ideal for large and small turbine control valves or governors, high speed engines, dynamo engines and other apparatus where possibly a gland pressure might interfere with the correct functioning of the apparatus. Used also for high pressure, high temperature steam header valves and for certain rotary work where the stuffing boxes are designed to receive such sets or where adapter rings are provided to cause stuffing boxes to conform to the bevel ring construction.

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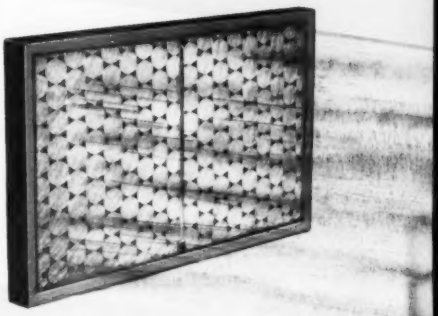
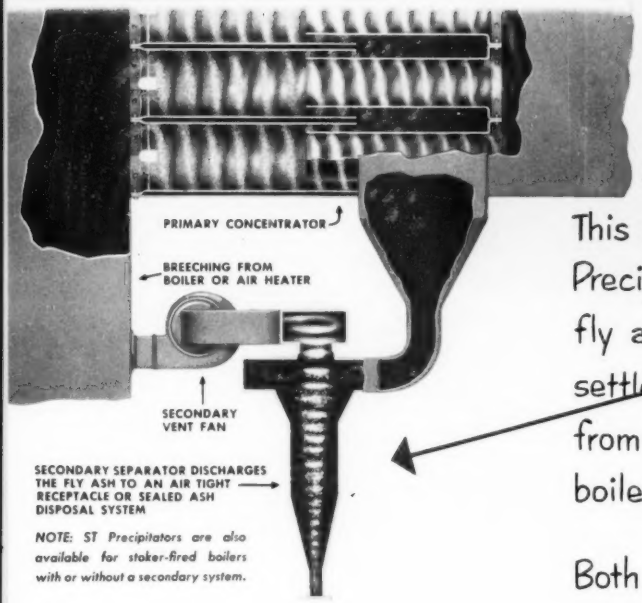
FIBROUS AND METALLIC PACKINGS FOR EVERY INDUSTRIAL PURPOSE

American Blower . . . a time-honored name in air handling

This forced-air furnace filter catches particles of dust and dirt that otherwise would be carried into the home.




BREECHING TO INDUCED DRAFT FAN
PRIMARY CONCENTRATOR
BREECHING FROM BOILER OR AIR HEATER
SECONDARY VENT FAN
SECONDARY SEPARATOR DISCHARGES THE FLY ASH TO AN AIR TIGHT RECEPTACLE OR SEALED ASH DISPOSAL SYSTEM

NOTE: ST Precipitators are also available for stoker-fired boilers with or without a secondary system.

This American Blower Fly Ash Precipitator collects the fly ash that otherwise would settle on the surrounding area from a pulverized fuel-fired boiler in a power plant.

Both products aid materially in the American plan for better living.

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AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

Serving home and industry

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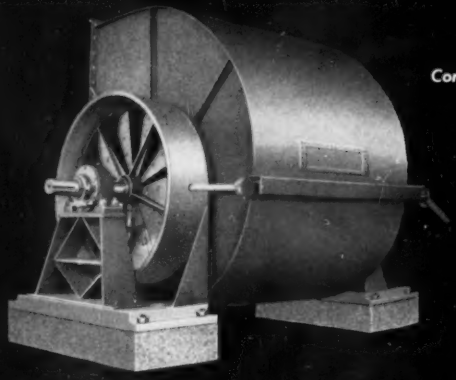
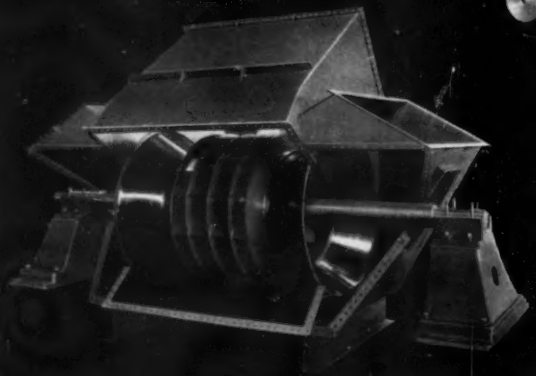
American Blower . . . a time-honored name in air handling



Complete fan assembly with variable inlet vane

Wheel and shaft assembly



Complete fan assembly where inlet boxes are required

AMERICAN HS FORCED DRAFT FAN

Memo to Power Plant Men —

You'll get high efficiency without entry loss and turbulence at a substantial power saving with non-overloading American Blower HS Fans for forced draft duty in your power plant.

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AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
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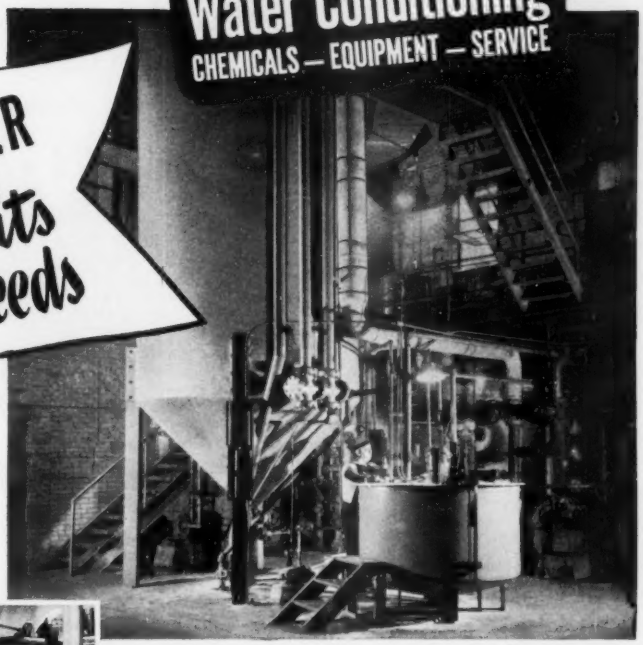
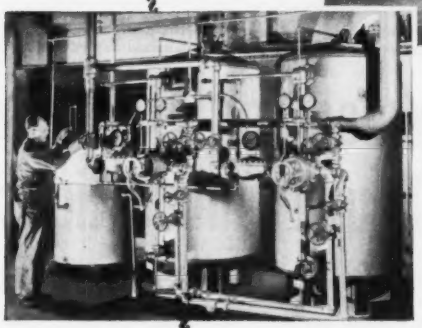
Water Conditioning

CHEMICALS — EQUIPMENT — SERVICE

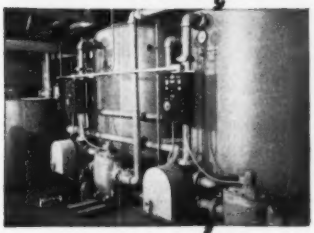
FOR WATER *that Fits Your Needs*



This hot process lime-soda softener for treating makeup to high-pressure boilers is rated at 5000 gph.



Sodium zeolite water conditioning equipment with capacity of 130 gpm provides boiler makeup to evaporator in an eastern utility power plant.



Dual automatic sodium zeolite water softener rated at 225 gpm is used in power plant of a Texas hospital.

TO ASSURE YOU water conditioned to your specific requirements, A-C engineers can draw on years of experience treating all types of water . . . plus a broad background of building turbines and processing equipment that are dependent on properly treated water. A-C water conditioning service includes:

Chemicals — for external and internal boiler water treatment . . . designed for silica removal and control of scale, corrosion and carryover. Also cooling cycle treatments . . . and dependable reagent chemicals.

Equipment — hot and cold process softeners . . . sodium and hydrogen zeolite softeners . . . alkalinity-reducing ion exchangers . . . deionizers . . . degasifiers . . . deaerating heaters . . . chemical feeding equipment . . . pumps . . . oil removal and water filters.

Comprehensive consultant service — surveys, reports . . . chemical and X-ray analysis . . . special studies.

WRITE FOR THESE BULLETINS

28X7636 — Meaning, Application and Measurement of pH

28X7559 — Hot Process — Hot Zeolite System

2886611 — Hot Process Softener

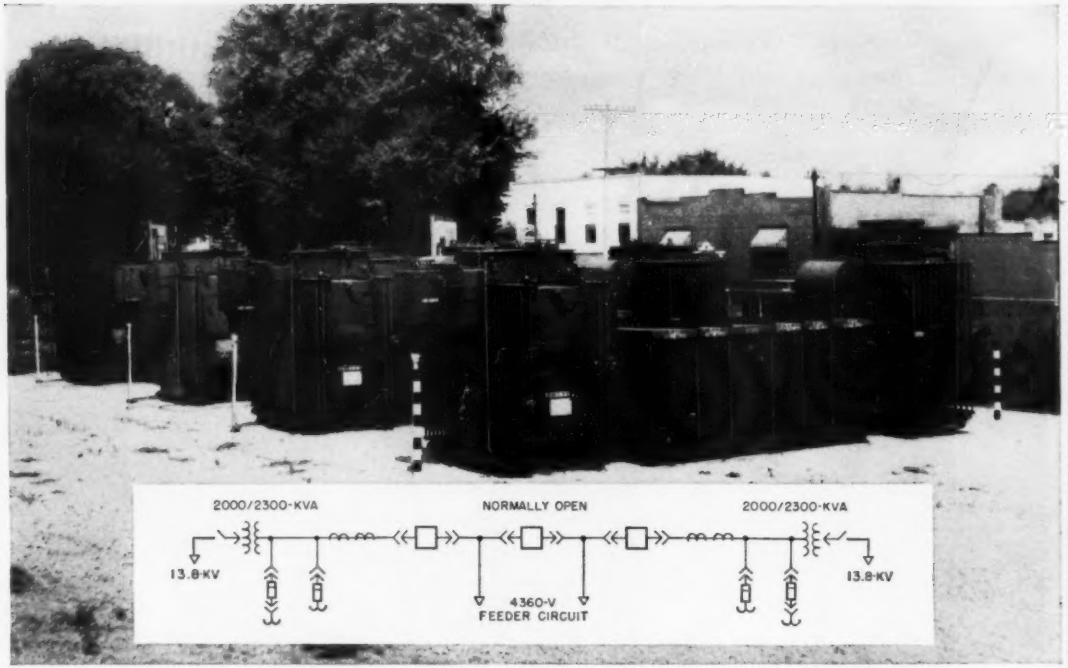
2887107 — Sodium Zeolite Softener

28X7808 — Alkalinity-Reducing Ion Exchanger

ALLIS-CHALMERS

A-3827

Milwaukee 1, Wisconsin



"BLOCK BUILDING" in Kansas City. Substation 45 points up "building block" method. Two G-E 4000/4600-kva master unit substations were installed in 1947, two more in 1949. One-line diagram (inset) shows type of standardized duplex station used.

Missouri utility plans ahead for expansion using standardized G-E unit substations

Kansas City Power & Light gains system flexibility with "building block" approach

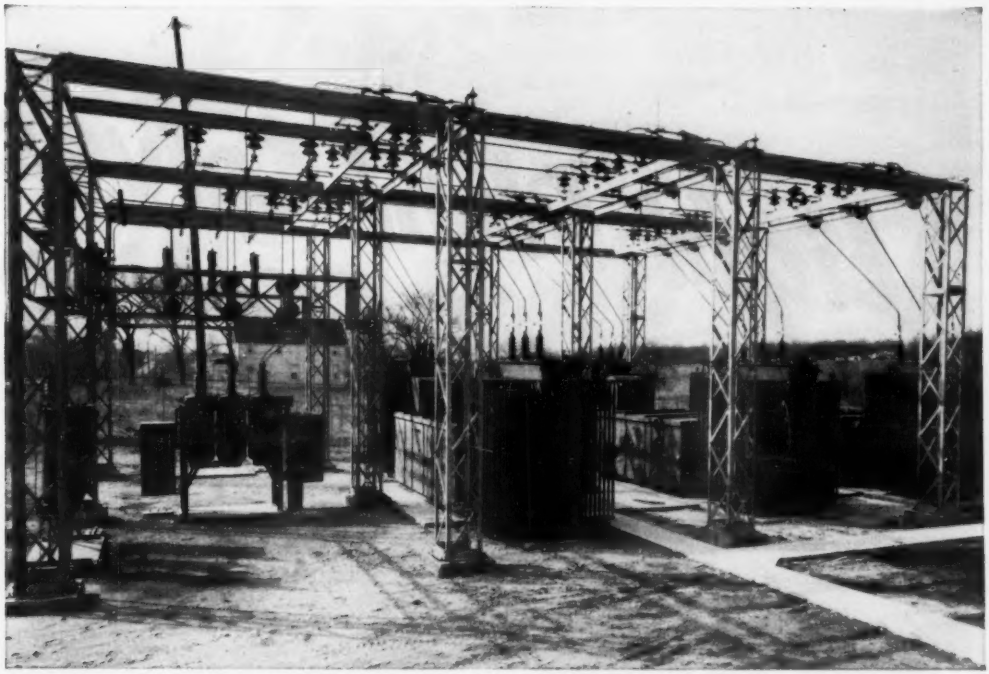
With 22 G-E standardized master unit substations installed over a five-year period, Kansas City Power & Light Co., Kansas City, Mo., knows the value of advanced planning—using duplicate units as "building blocks" in its system.

This "building block" method—which permits adding or removing capacity in easily handled, relatively small "blocks of power"—has enabled the Missouri utility to expand its system simply and economically. Engineers early decided upon the unit substation which best suited their purposes—in this instance, a G-E 4600-kva duplex unit.

In addition, utility engineers have achieved maximum flexibility to take care of unexpected load growth. They can meet load shifts simply by shifting the standardized G-E units. If the load should change radically, they can move quickly to other types of standardized G-E unit substations, still employing the "building block" approach.

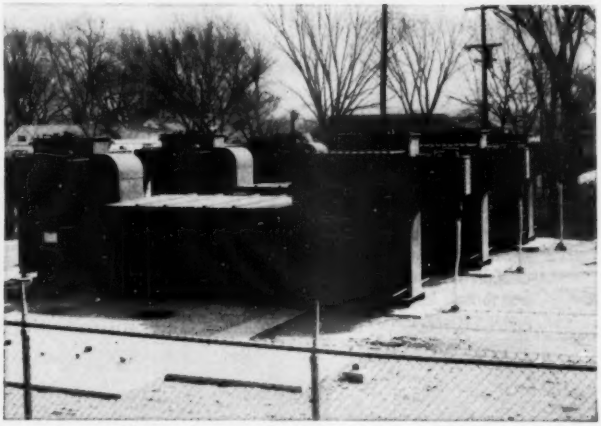
Your needs most likely parallel those of the Kansas City utility, and you, too, will find that advanced planning with the "building block" method keeps system investment as low as possible in relation to actual load. Small "blocks of power," with their flexibility and economy, give insurance against excessive investment in unused capacity.

At the same time, G-E factory-assembled master unit substations simplify planning and purchasing—save time in delivery and installation. And with G-E equipment, you are assured of dependable, first-quality components made possible by repetitive manufacturing methods. For full information, write for Bulletins GEA-3800 and GEA-4500. *General Electric Company, Schenectady 5, New York.* 321-100



STANDARDIZED SUBSTATION. Supplied complete by General Electric, 3 units and steel structure of Substation 30 were delivered ready for immediate installation. Factory-engineered substations simplify purchasing, save valuable engineering time.

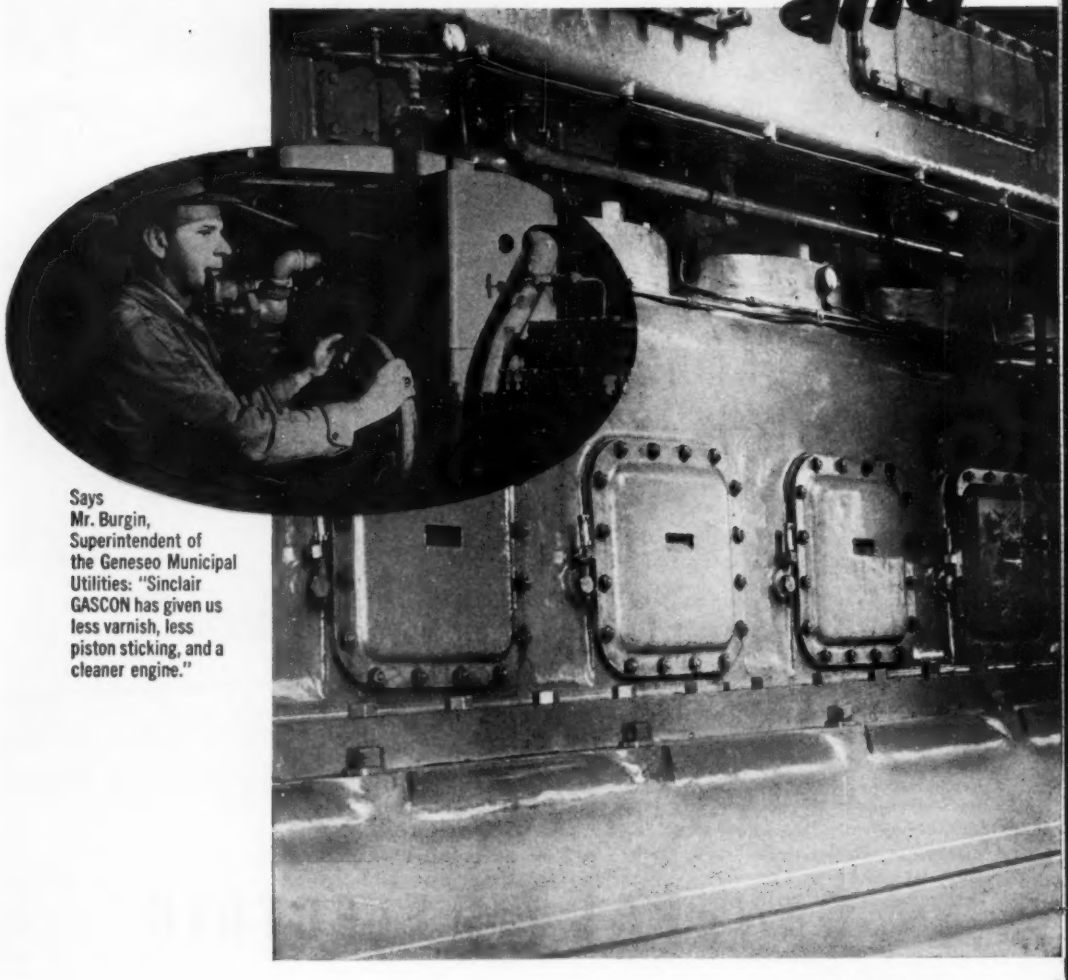
CONCEALED BY TREES. This one-unit substation in residential area shows how proper planting can effectively camouflage installations.



READY FOR NEXT UNIT. Kansas City's Substation 84 has three duplex units already installed. Foundation, in foreground, is set for fourth unit, if required for increased load.

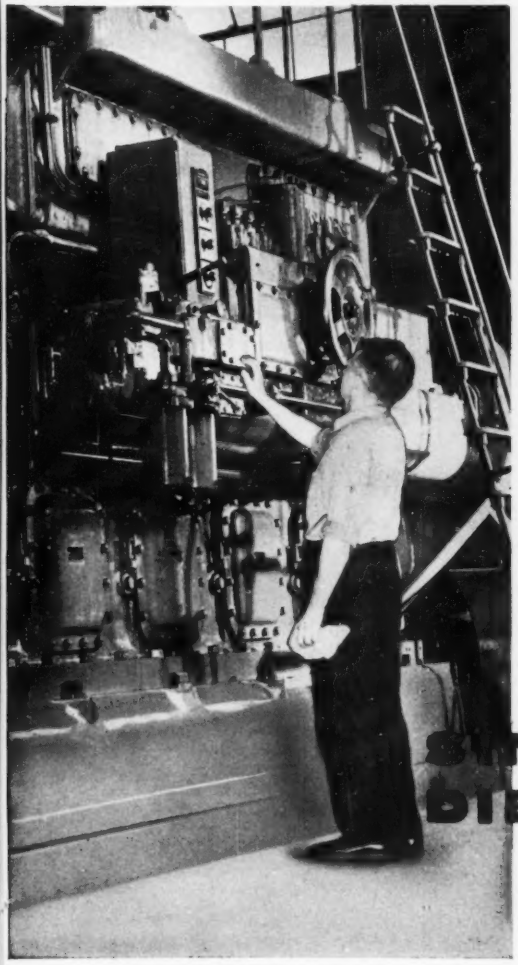
GENERAL ELECTRIC

Light Plant Solves of Sticking and



Says Mr. Burgin, Superintendent of the Geneseo Municipal Utilities: "Sinclair GASCON has given us less varnish, less piston sticking, and a cleaner engine."

Problems Rings Carbon Build-Up!



For quite some time the Light Plant of Geneseo Municipal Utilities, Geneseo, Ill., had trouble with sticking rings, and with carbon deposits in the exhaust ports of its diesels. A few years ago these diesels were changed over to Sinclair GASCON D. Almost at once, it was noted that the troublesome conditions started to clear up. In the time since, sticking rings have become the rare exception and the carbon deposits are no longer a problem.

Furthermore, in 1947, a 1400 hp. Fairbanks-Morse engine, shown at left, was installed and filled with GASCON D. This engine has never had a sticking ring and is running remarkably clean, with exceptionally low cylinder wear.

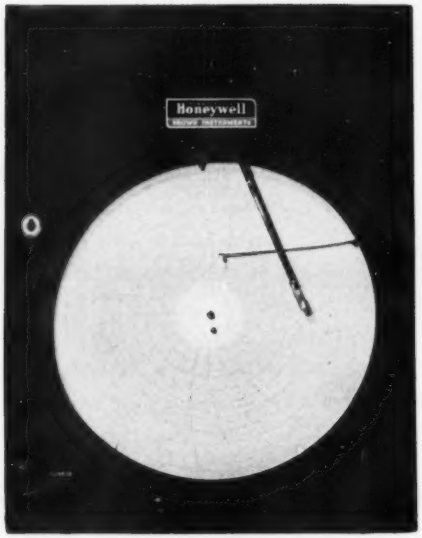
Perhaps GASCON® Oil can cure *your* diesel troubles, too. Get in touch with your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Ave., New York 20, N. Y.

SINCLAIR DIESEL OILS

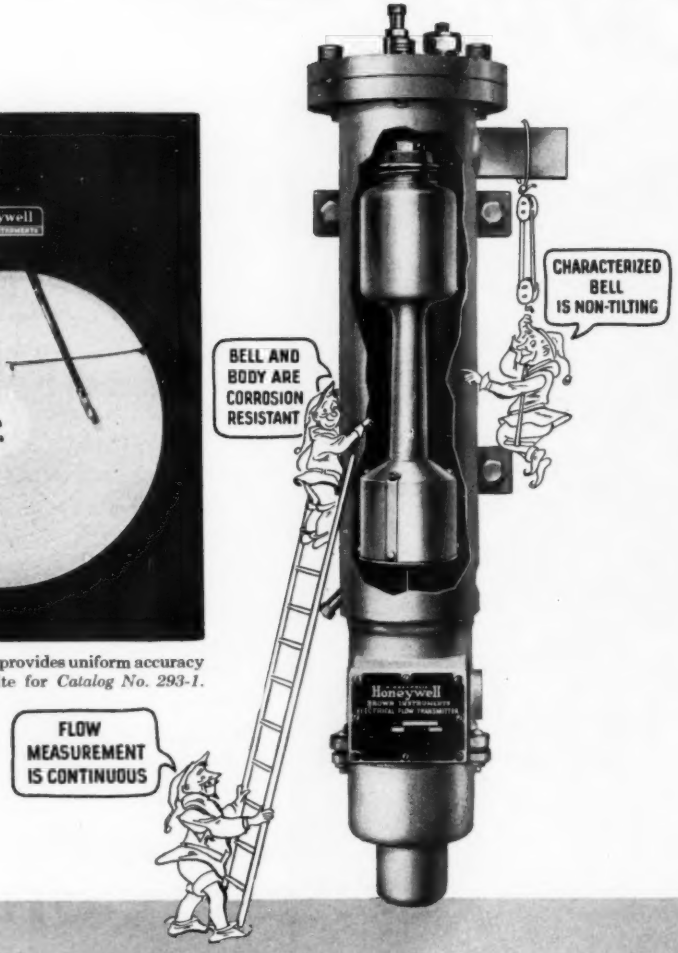
prolong engine life

Important Contribution to

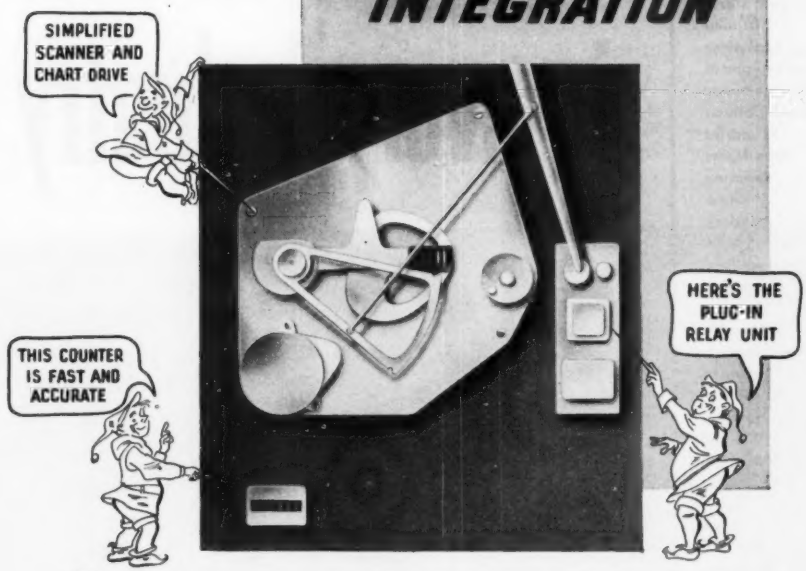
The
Brown Electric Flow Meter



EVENLY DIVIDED CHART... provides uniform accuracy for all rates of flow. Write for *Catalog No. 293-1.*



incorporates . . . ELECTRONIC INTEGRATION



Two important features...evenly divided chart and electronic integration... facilitate flow cost accounting; eliminate intermittent measurement and slow, complicated totalizing.

The electronic integrator, consisting of but three major parts, simplifies accessibility and maintenance . . . permits quick checking and calibration. Scanning is rapid and extremely simple. The corrosion resistant meter body is of tubular construction, reducing weight and bulk. Transmission is electric. Mechanical flow meters, evenly graduated and similar to that shown, but with the bell directly coupled to the recorder pen are also available. Recorder is fast, chart is easily read under all conditions of flow. The characterized bell is corrosion resistant, too, and is specially designed to eliminate tilting.

Call in our local engineering representative for a discussion of your application.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4490 Wayne Ave., Philadelphia 44, Pa.

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BROWN INSTRUMENTS

First in Controls

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Write for a copy of Catalog No. 293-1, "Evenly Graduated Flow Meters" . . . and Bulletin No. 90-2, "Supervisory Instruments for Power Generation."

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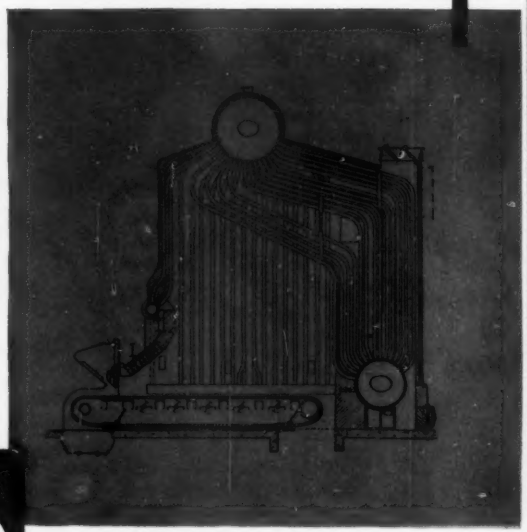
VU—the choice of Leaders in every Industry



VU-10 Boiler — This unit, one of three duplicates, is installed in a food processing plant. It is fired by a chain grate stoker. Capacity — 25,000 lb of steam per hr; operating pressure — 125 psi; no superheat.

C-E

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

Wherever steam is important for power, heating or process — you'll find C-E Vertical-Unit Boilers (Type VU) establishing new standards of reliable, efficient operation. In industry after industry, leading manufacturers are setting the pace with VU Units.

Food and Beverage companies are typical examples of the widespread acceptance Vertical-Unit Boilers find in industries everywhere. Many of the leading food processors, as shown below, are consistent users of VU Boilers.

But why list only the larger companies, when so many VU Boilers are used in smaller plants? Chiefly because the practices of the big companies form a helpful buying guide. Large companies buy boilers frequently so their experience is always up-to-date. They buy them for different plant locations and for a variety of operating conditions. Thus, they have the accumulated knowledge and broad experience needed to make sound boiler selections.

You can profit from this industry's experience — or from that of any industry that has large steam requirements. So if you need reliable, low-cost steam in any amount ranging from 10,000 to 350,000 pounds per hour, it will pay you to investigate the advanced design ... sound construction ... proved reliability of C-E Vertical-Unit Boilers. B-598

Leading Food and Beverage Companies using VU Boilers in one or more plants

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American Sugar Refining Co.
Anheuser-Busch, Inc.
Armour & Co.
J. E. Brach & Son, Inc.
Curtis Bros.
General Foods Corp.
H. J. Heinz Co.
Penick & Ford, Ltd., Inc.
Joseph Schlitz Brewing Co.
W. F. Schrafft's & Sons, Inc.
Spreckels Sugar Co.
Sunshine Biscuits, Inc.
Swift & Co., Inc.
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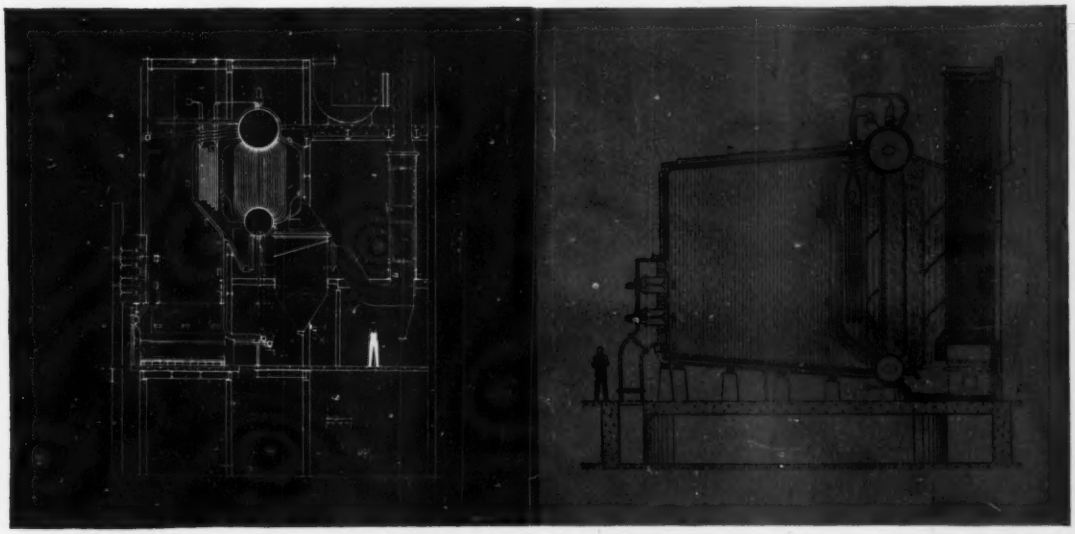


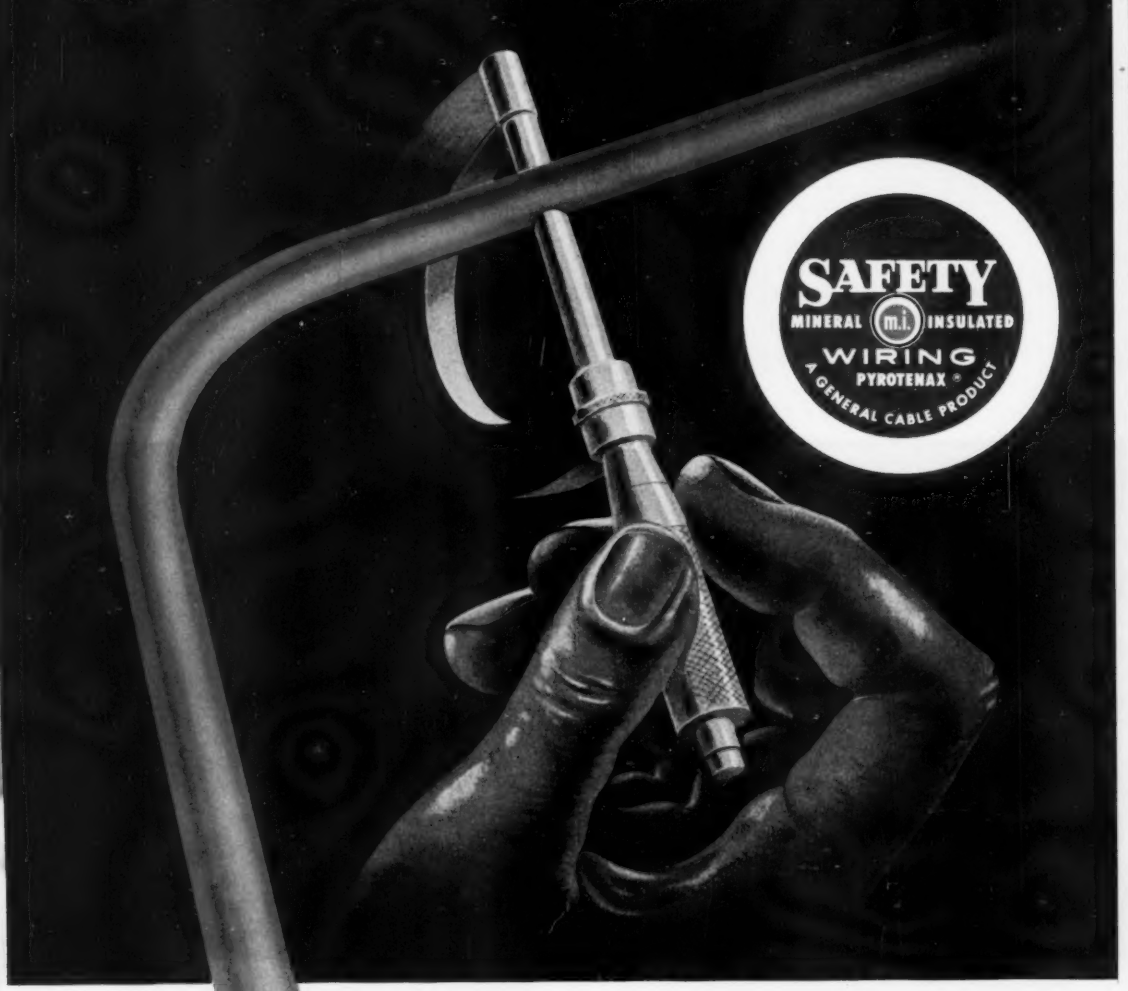
VU-40 Boiler — This unit is installed in the plant of a food product company. It is fired by oil; arranged for future pulverized coal. Capacity — 60,000 lb of steam per hr; operating pressure — 250 psi; steam temp. 600 F.

VU-50 Boiler — This unit is one of two duplicates installed in a brewery. They are fired with oil or gas. Capacity — 100,000 lb of steam per hr; operating pressure 550 psi; steam temperature 700 F.

—SUPERHEATER, INC.

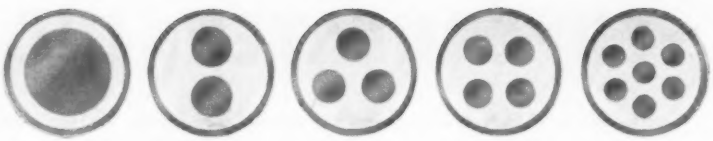
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

SAVES SPACE!



SAFETY m.i. WIRING*
with fittings to connect
to standard boxes
and equipment

**Exclusively A General Cable Product*



SIZES
16 TO 4/0 A.W.G.

SIZES
16 TO 4 A.W.G.

SIZES
16 TO 4 A.W.G.

SIZES
16 TO 6 A.W.G.

SIZES
16 TO 10 A.W.G.

SAFETY m.i. WIRING

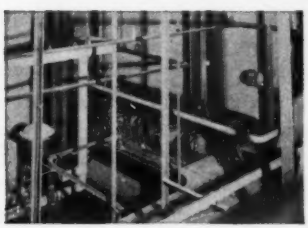
...with smaller diameter, fits readily into small or restricted spaces.

A Safety mineral insulated Wiring circuit can be installed around bends, corners, or on vertical risers without the use of additional accessories. As machine wiring it can be trained in tight quarters... too tight for any wire of larger diameter.

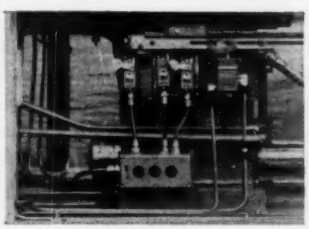
Yes, Safety m.i. Wiring, enclosed in its integral conduit-sheath, is a definite space saver in addition to all of its other special advantages. Space bottlenecks are eliminated and installations are made quickly and economically.

So unusual are the advantages of this new General Cable product, and so important are they to you, that you will want to know more about it. For full details, write your nearest General Cable office.

"More Power to You"®



The space saving advantages made possible by the small outside diameter of all Safety m.i. Wiring are well demonstrated by this control board installation in a large chemical plant.



Here is a close-up of a Loewy-Hydropress machine using Safety m.i. Wiring. Note the smooth surface — so easy to keep clean. Its small diameter saves space and insures neatness.

SAFETY m.i. WIRING SYSTEM PROVIDES ADVANTAGES NEVER BEFORE ACHIEVED!

OUTLASTS STRUCTURE IN WHICH INSTALLED! Immune to age-deterioration due to its "all-mineral" construction. Unaffected by high temperatures resulting from current overloads, either accidentally imposed or to meet emergency increased power demands.

ONE STEP INSTALLATION! No additional mechanical protection required. Safety m.i. Wiring is its own conduit. Available fittings permit installation in one operation using standard switch and junction boxes. Smaller diameter saves space, assures neat appearance.

NO VAPOR PASSAGE! Completely filled with compacted mineral insulation, the metal sheath hermetically sealed ends in the cable run to prevent the passage of combustible gases through the wiring system.

COMPLETELY MOISTURE-PROOF! Simple fittings permanently seal both ends of each run of wiring. No possible entrance for moisture. Normal concern over this hazard is thereby completely eliminated.

STILL YET FLEXIBLE! Thumb pressure bending in ordinary shop easily fashions orderly craft patterns — conforms wiring to any contour. Once formed, is not fastened with expensive clamps or straps. Safety m.i. Wiring stays put.

NO HEAT DETERIORATION! The mineral insulation of Safety m.i. Wiring is physically stable up to 2800° C., thereby assuring against deterioration by heat, even beyond the melting point (1083° C.) of the copper sheath.

GENERAL CABLE
CORPORATION

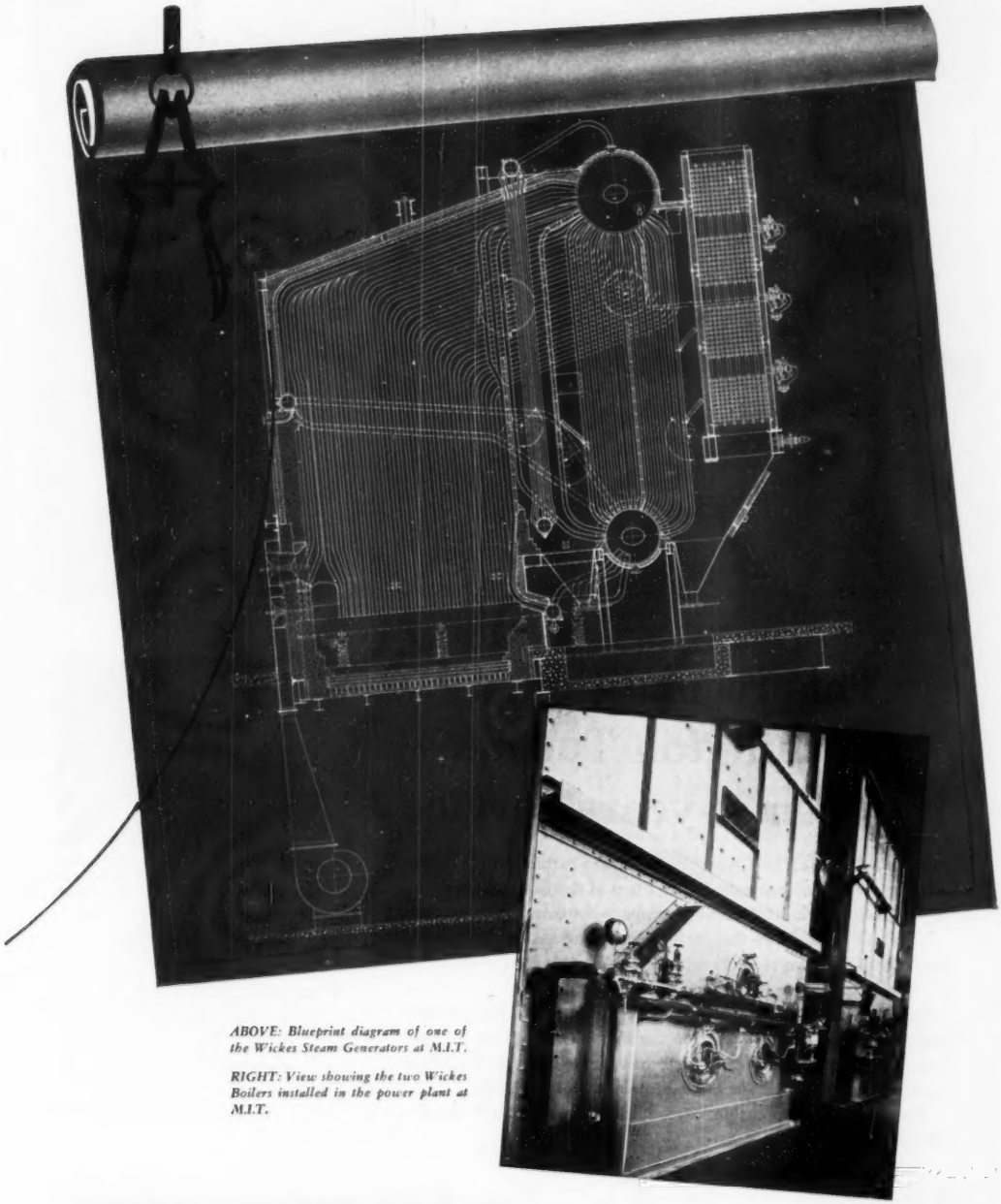
EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

M.I.T., famous engineering school, uses WICKES boilers for steam production

Consultants — JACKSON & MORELAND, ENGINEERS of Boston, Mass.

AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY, where sound engineering principles are taught, two Wickes Steam Generators were selected to supply heat for several new buildings including the Hayden Library and Sloan Metals Research Laboratory. The Wickes Boilers, which were custom-engineered for M.I.T., produce 160,000 lbs., of steam per hour. They occupy the same space formerly occupied by the two old boilers that produced only 40,000 lbs. per hour. They are equipped with superheaters and economizers. The new boilers are oil-fired at present but are engineered for ready conversion to spreader stoker if desired. They are designed for quick steaming to meet emergency power requirements and are fitted with thermowells and openings for taking flue gas samples so the students at M.I.T. can run boiler tests as part of their instruction. The installation of these boilers, an extremely difficult job because of the close erection tolerances, was handled by Flagg, Brackett & Durgin, Inc., Wickes' agents in Boston. ✓ ✓ ✓ Wickes can fill your requirements for steam generators up to 250,000 lbs. per hour and 1000 psi.—all types of multiple drum boilers adaptable to any standard method of firing; oil, gas, underfeed or spreader stoker. Write today for descriptive literature or consult your nearest Wickes representative.

RECOGNIZED QUALITY SINCE 1854



ABOVE: Blueprint diagram of one of the Wickes Steam Generators at M.I.T.

RIGHT: View showing the two Wickes Boilers installed in the power plant at M.I.T.

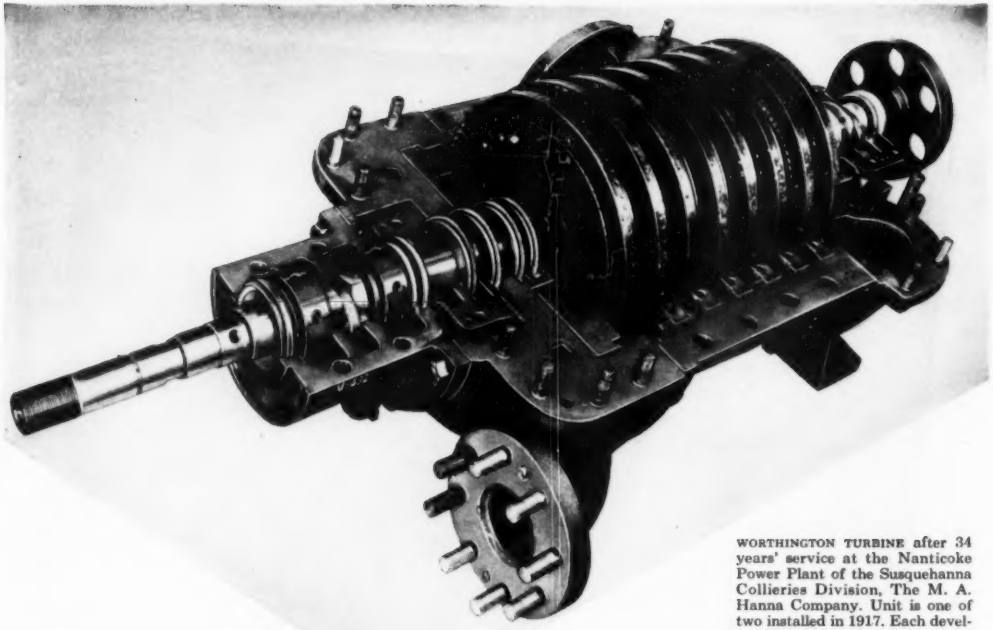
WICKES

142

THE WICKES BOILER CO.

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

SALES OFFICES: Atlanta • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit • Greensboro, N.C. • Houston • Indianapolis • Los Angeles • Memphis • Milwaukee • New York City • Pittsburgh • Portland, Ore. • Saginaw • Springfield, Ill. • Tampa, Fla. • Tulsa • Washington, D.C.



WORTHINGTON TURBINE after 34 years' service at the Nanticoke Power Plant of the Susquehanna Collieries Division, The M. A. Hanna Company. Unit is one of two installed in 1917. Each develops 70 hp when operated on inlet steam of 125 psig and exhausting to atmospheric pressure.

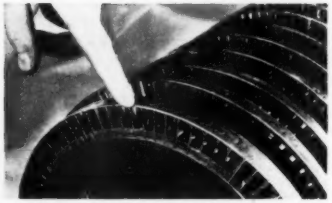
This reconditioned Worthington Turbine has seen 34 years' service

Installed in 1917, this Worthington steam turbine will probably go on to serve the Nanticoke Power Plant of the Susquehanna Collieries Division, The M. A. Hanna Company, for many years to come.

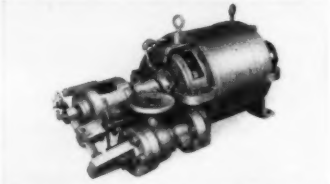
This unit is one of two that for 34 years have been driving induced draft fans—and was recently returned to Worthington's Wellsville, N. Y., plant for reconditioning.

Whether your requirements call for 70 hp or 24,000 hp, the complete Worthington line offers you the right steam turbine for your mechanical drives—a rugged performer that's ready to serve you economically and give you years of uninterrupted service.

Worthington Corporation, Steam Turbine Division, Wellsville, New York.



CLOSE-UP OF TURBINE BLADING shows that, except for a few single insertions, it remains the same as when turbine was installed 34 years ago.



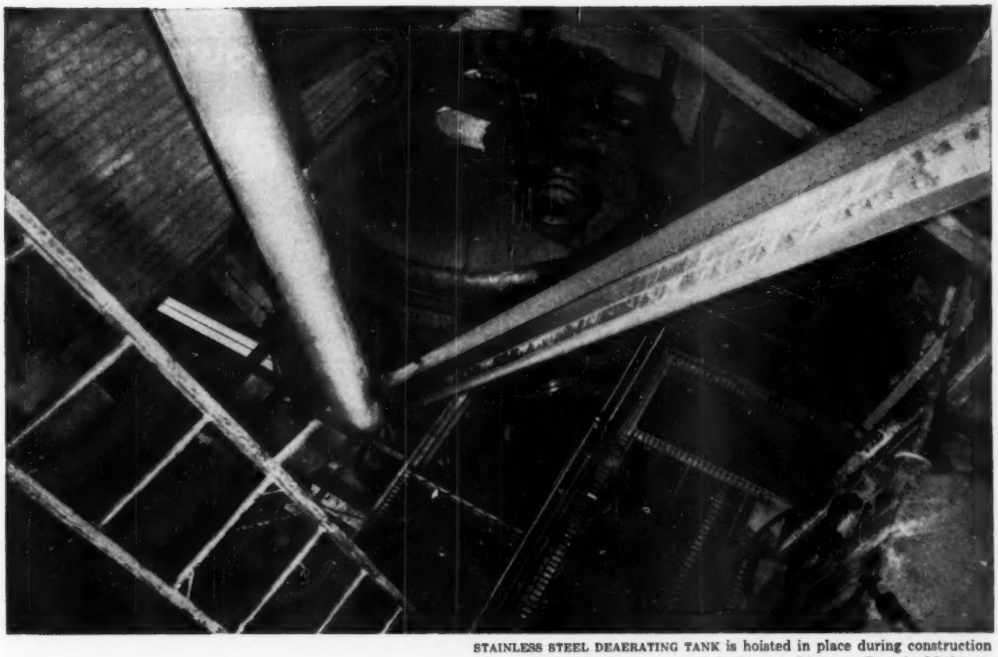
COMPLETE TURBINE—ONE OF THE TWO that have been driving fans for Susquehanna Collieries since 1917.

T.2.3

A GREAT TEAM IN STEAM

WORTHINGTON

Steam Turbines



STAINLESS STEEL DEAERATING TANK is hoisted in place during construction of one of Detroit Edison Company's Heating Plants at Detroit, Michigan.

When CO_2 Caused a Headache ...Worthington Cured It

Detroit Edison had the solution to its problem —the problem of CO_2 in its steam—except for one thing.

Zeolite-softened municipal water used in their steam plant contains high percentages of carbonates which decompose and generate CO_2 in the boilers. Carried over with the steam into heating and processing equipment, that CO_2 could cause plenty of trouble.

The CO_2 problem was solved by Detroit Edison engineers by acid treating the softened water, converting the carbonates to CO_2. The gas thus formed is driven off in a deaerator.

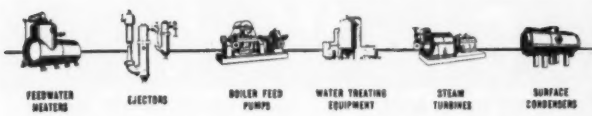
However, no standard deaerator could successfully remove the large quantities of CO_2 released by the acid treatment, and deliver water to the boiler with practically zero oxygen and zero CO_2. Furthermore, standard materials would have lasted only a few months under such conditions.

NON-CONTAMINATED STEAM

Worthington provided the answer. Detroit Edison engineers selected a Worthington deaerator specially designed for these severe conditions, built entirely of stainless steel, and guaranteed to deliver water containing not over 0.005 ppm of oxygen and not over 0.1 ppm of CO_2. The result is steam containing so little CO_2 that the amount *cannot be accurately measured!*

On problems like this one, Worthington not only furnishes *all* of the equipment needed in a complete water treating installation, but also has the engineering ability to work with your engineers on the *complete* problem of generating steam for power or processing. For further information on why *there's more worth in Worthington*, address Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, New Jersey.

5.1.2

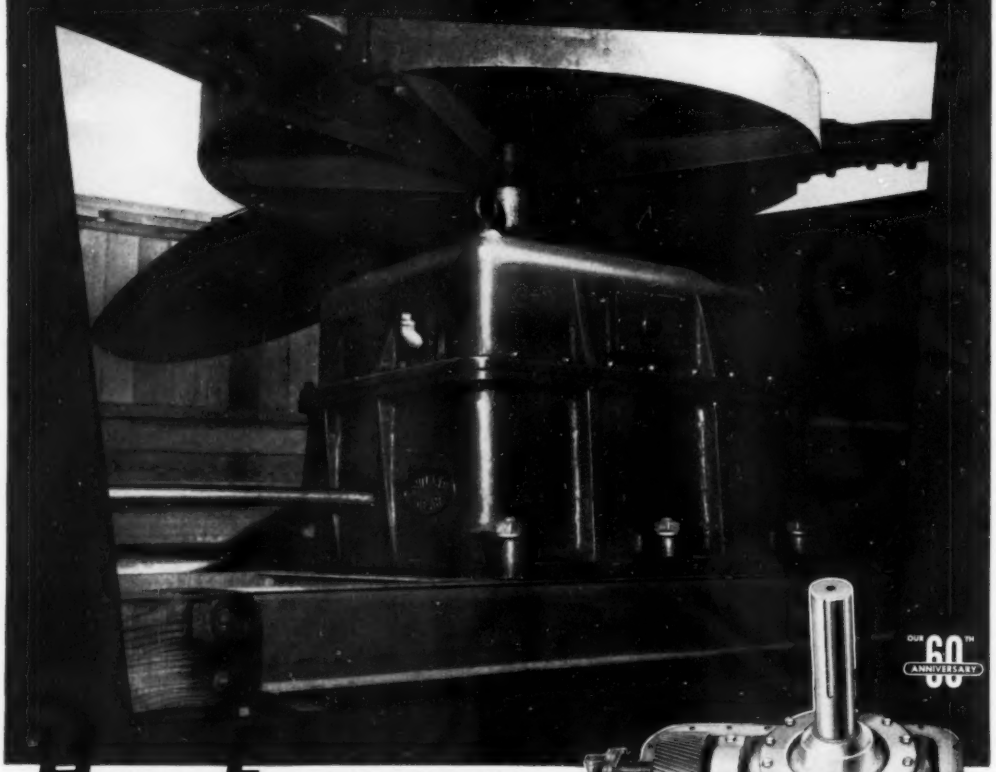


A GREAT TEAM IN STEAM

WORTHINGTON

Feedwater Heaters

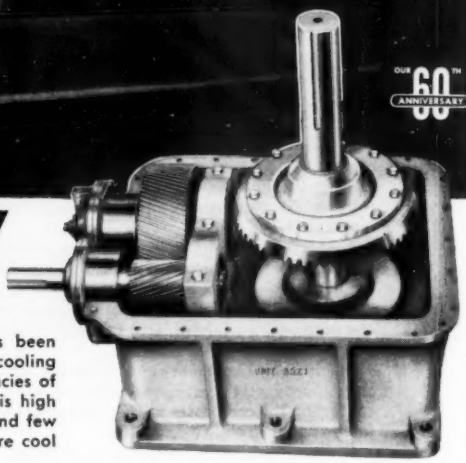
PHILADELPHIA SPIRAL-BEVEL COOLING TOWER DRIVE



OUR 60™ ANNIVERSARY

HIGH EFFICIENCY

CUTS POWER LOSS



The Philadelphia Spiral-Bevel Cooling Tower Drive has been developed to transmit the heavier fan loads of today's cooling towers. Many of these units are now operating at efficiencies of 97-98% under the most severe operating conditions. This high efficiency means minimum power loss, less maintenance and few oil changes during the long life of the reducers. Units are cool operating.

A wide range of sizes are available for every cooling tower application.

The drive shown above is on a cooling tower designed and built by Hudson Engineering Company. It is typical of many such installations.

Construction features of the Philadelphia Spiral-Bevel Cooling Tower Drive are given in Bulletin CT-51. Write on your business letterhead for a copy.

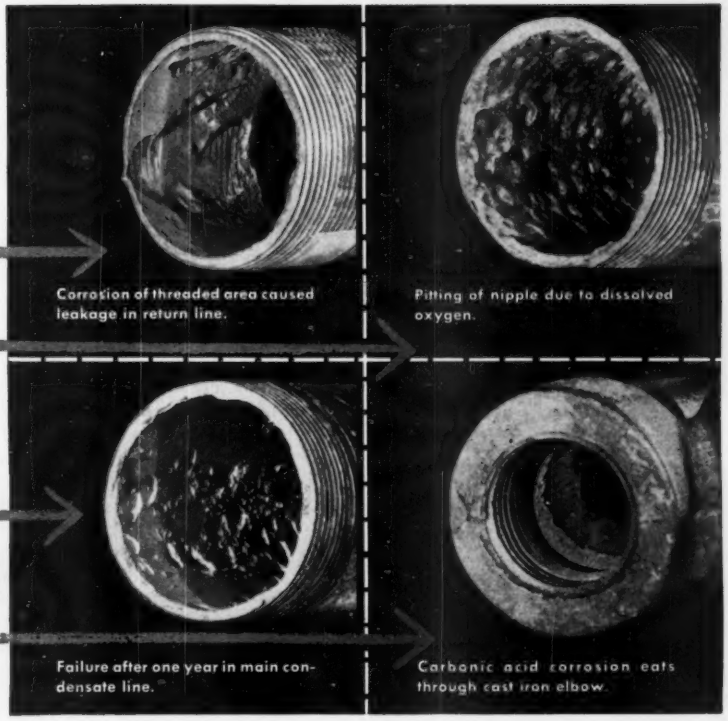
Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

victims of Return Line Corrosion



Corrosion of threaded area caused leakage in return line.

Pitting of nipple due to dissolved oxygen.

Failure after one year in main condensate line.

Carbonic acid corrosion eats through cast iron elbow.

Dearborn Formula 702 will prevent Corrosion caused by low pH values

Excessively low pH values of water—caused by dissolved carbon dioxide—result in corrosion that destroys return line sections such as these.

The destruction of such valuable parts is easily and economically prevented with Dearborn Formula 702. Introduced directly into the boiler feed water, Formula 702 forms a continuous amine-type film on the return lines to effecively coat the lines against corrosion. In addition, Formula 702 will automatically repair any surface where the film has been broken by loosened rust scale, and also improve heat transfer in the line, thereby reducing the cost of steam production.

Your Dearborn Engineer will gladly demonstrate how you can reduce the cost of maintenance and avoid shutdowns with Dearborn Formula 702. Why not call him today?

DEARBORN CHEMICAL COMPANY

Merchandise Mart Plaza • Chicago 54, Illinois

BASIC PATENTS

Dearborn holds the basic patents (U.S.Pat. 2400543) for the use of filming amines for treating water.

YOU'LL WANT A COPY OF THIS BULLETIN Bulletin 5013, which outlines the causes of return line corrosion and the method of cure with Formula 702, will be sent on request.

Dearborn Chemical Company Dept. PO
Merchandise Mart Plaza
Chicago 54, Ill.

☐ Send a copy of Bulletin 5013
☐ Have a Dearborn Engineer call

Name.....

Position.....

Company.....

Address.....

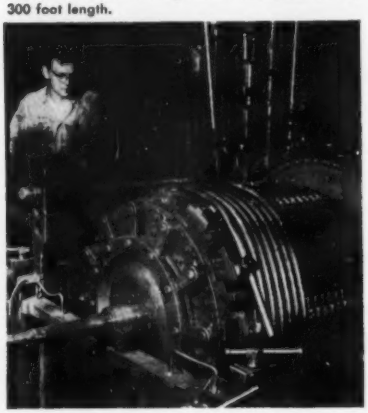
City.....*Zone*.....*State*.....

Dearborn

TRADE MARK REGISTERED

THE LEADER IN WATER TREATMENT AND RUST PREVENTIVES

THIS WORKMAN is welding standard lengths of National Seamless Tubing into a continuous 200 or 300 foot length.



HERE, the National Seamless is cold wound into shape. It easily withstands this severe forming operation.

using 561 feet of NATIONAL

Midget generator

● This four-car railroad pile driving rig has a total weight of over *660,000* pounds.

On just 75 gallons of oil per day, the steam generator shown here* (similar to the type used to heat diesel powered passenger trains) will move the entire rig down the track at 15 to 20 miles per hour, drive the air brake compressor, operate the hammer continually and furnish steam for the hoist—all this in a generator you could put in an ordinary clothes closet!

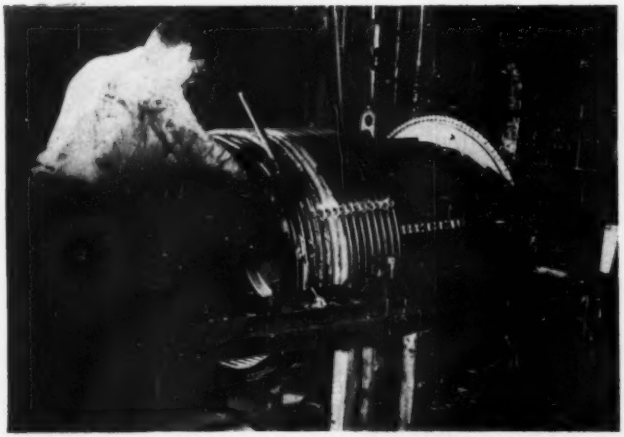
For size and weight, this is the most powerful steam-making machine ever developed.

Heart of this generator is a set of National Seamless Steel Tube coils over 561 feet long. Standard lengths are welded into 200 or 300 foot lengths, then cold rolled into a coil that must withstand a 1200 psi hydrostatic pressure test.

The National Seamless Tubes do a fine job despite the severe fabrication method and rigorous tests. These tubes can take it, because there aren't any welds to weaken or injure the tube. Every tube is actually pierced from a solid billet of high quality steel—the *one* manufacturing method that removes all doubt concerning uniform wall strength.

When you plan to use tubes in the future, be sure to specify National Seamless. They are made by the world's largest, most experienced manufacturer of tubular steel products.

**Manufacturer's name on request.*



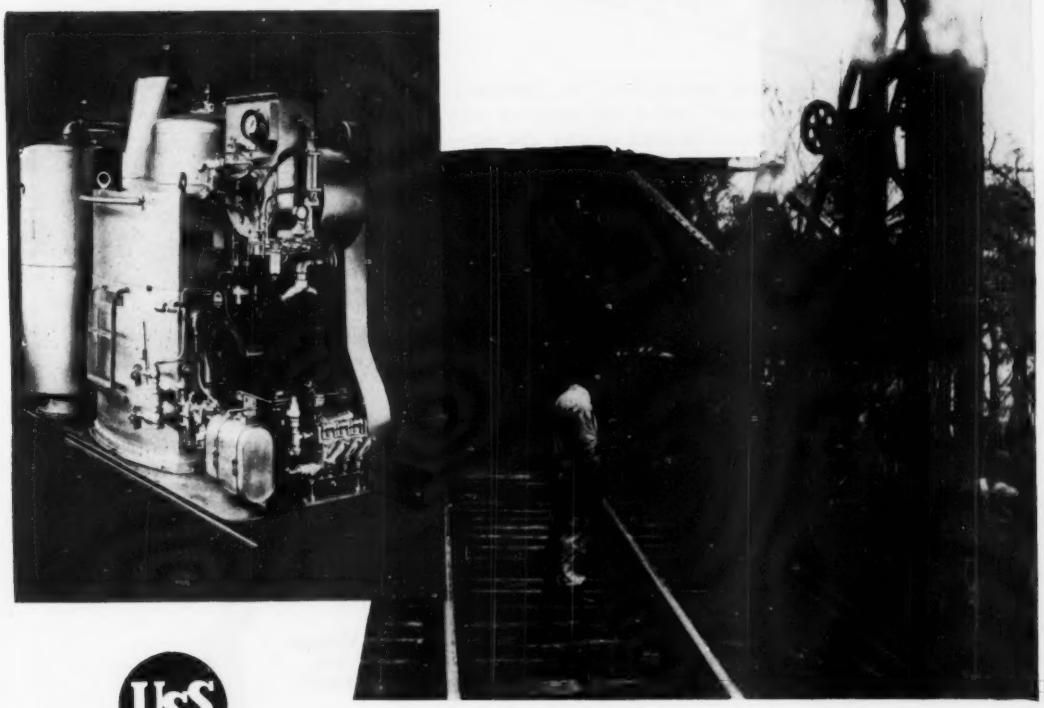
AFTER THE COILS are welded into position, the jig collapses and the coils are removed.

COMPLETED COIL is now lowered into position, ready to carry cold (50°F.) water into the 3000°F. flame.

SEAMLESS TUBES

drives giant pile driver

develops full pressure in just 2 minutes from a cold start



USS

NATIONAL TUBE DIVISION, UNITED STATES STEEL COMPANY, PITTSBURGH, PA.
(TUBING SPECIALTIES)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL *Seamless* TUBES

UNITED STATES STEEL

GET THE EQUIVALENT OF ADDED BOILER... Capacity

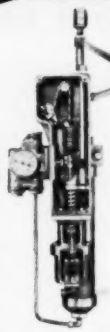
CASH STANDARD AUTOMATIC COMBUSTION CONTROL SYSTEMS

★ Through the simple means of CASH STANDARD Automatic Combustion Control, the output of your present boiler can be boosted to give you more steam for increasing power and process needs. In accomplishing this you save fuel, for you cut wastage of coal, gas, or oil through correct fuel feed.

CASH STANDARD instruments maintain the proper proportion of air supply continuously so that you maintain effective combustion . . . where such controlled combustion exists there is no under-firing to cut steam supply nor over-firing to waste fuel. Through the proper operation of the stack damper, heat is not absorbed by excessive air above the fire and thereby lost through the stack . . . the heat goes direct to the boiler water to give you more steam.

CASH STANDARD Automatic Combustion Control can be applied to all plants from the largest to those as small as 75 boiler horsepower. The units shown here make up a complete CASH STANDARD System and all boiler requirements can be supplied through availability of variations of these units.

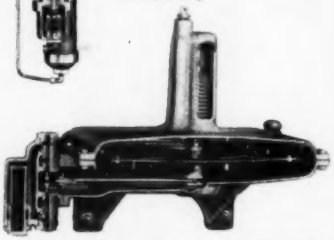
Bulletin No. 300 gives the complete story on Automatic Combustion Control for steam plant economy.



CASH STANDARD FUEL FEED CONTROLLER . . .

Automatically Regulates Fuel Feed

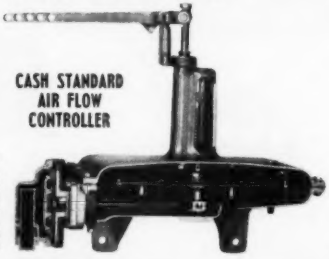
This CASH STANDARD Master Controller automatically regulates fuel feed. Locate it conveniently. Working from boiler pressure, it will adjust the rate of combustion by regulating the rate at which fuel (any kind of fuel) is supplied to the boiler furnace. And it will adjust the Air Flow Controller so the correct amount of air is supplied for proper combustion — hence, money saving.



CASH STANDARD FURNACE DRAFT CONTROLLER

Maintains a Constant Draft in the Combustion Chamber

This CASH STANDARD Furnace Draft Controller (which comes complete with Operating Power Cylinder) works from overfire draft, regulating the boiler uptake damper to maintain a constant draft in the combustion chamber.



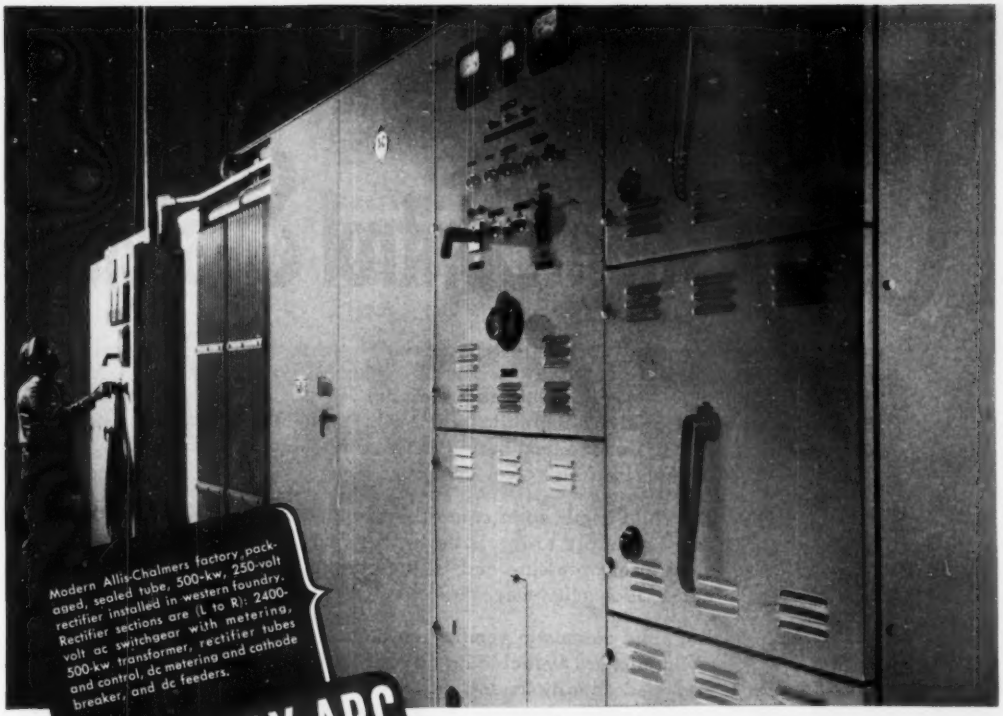
CASH STANDARD AIR FLOW CONTROLLER

Meters the Air Needed for Combustion

This CASH STANDARD Air Flow Controller meters the air needed for combustion. Install it near its damper. It is not affected by changes in fuel bed resistance or any other variables, because it meters air supply according to the differential pressure through the gas passages of the boiler, doing its part to insure perfect combustion.

A. W. CASH COMPANY
DECATUR, ILLINOIS

CASH STANDARD CONTROLS . . VALVES



Modern Allis-Chalmers factory packaged, sealed tube, 500-kw, 250-volt rectifier installed in western foundry. Rectifier sections are (L to R): 2400-volt ac switchgear with metering, 500-kw transformer, rectifier tubes and control, dc metering and cathode breaker, and dc feeders.

MERCURY ARC RECTIFIERS

For Critical DC Service

Supply Power for Centrifugal Pipe Casting Machines at Western Foundry

PRODUCTION UNIFORMITY DEPENDS on accurately regulated dc supply at the U. S. Pipe & Foundry Company, Decoto, California.

Variable speed dc drives on the centrifugal pipe casting machines *must* start quickly and accelerate at a *controlled* rate to distribute the melt uniformly throughout the mold before it hardens. *Reliability* is also vital since dc powers not only the casting machines but also the cranes transporting the molten metal.

The Allis-Chalmers 500-kw sealed tube mercury arc rectifier seen here was recently installed to meet these critical requirements. This rectifier combines the good regulation and low maintenance characteristics of the mercury arc rectifier with the following *exclusive* A-C refinements:

- **Fixed excitation anode** that doesn't contact mercury and is independent of level, turbulence or impurities.
- **Continuous excitation** — pilot arc always present, eliminating need for continuous and synchronized re-ignition. Rectifier will ride through severe ac voltage disturbances.
- **Grid phase control** — in cleaner region near anode, where ion density is lowest.
- **Internal cooling system** — high heat transfer with seamless tube cooling coil located within the rectifier.
- **Arcover-free tube** — eliminates danger of arcing-over to tube by insulating entire arc path.
- **Enameled anode seals** — multi-layer fused vitreous construction provides high strength, trouble-free seal.

Allis-Chalmers sealed tube rectifiers are supplied in ratings from 200 kw at 250 volts to 1000 kw at 600 volts. When planning a rectifier installation of *any* size, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis.

A-3855

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

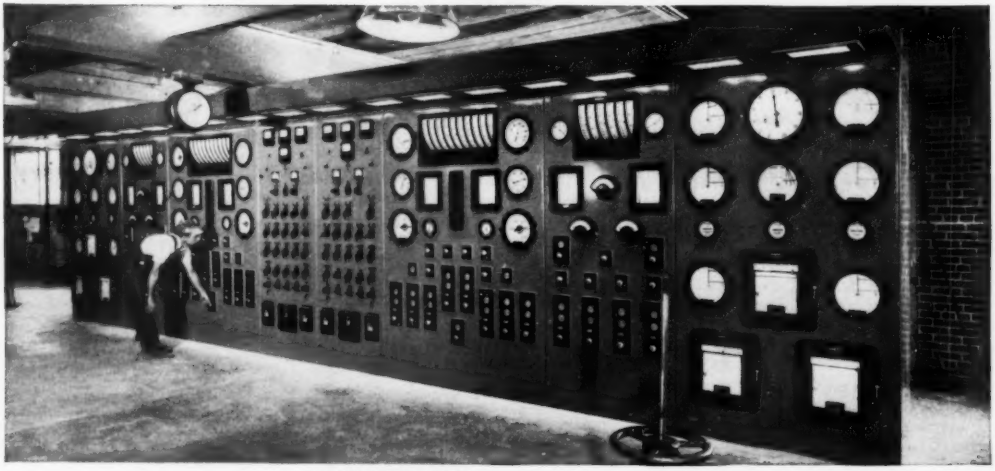
Our Engineers Introduced Mercury Arc Rectifiers to U. S. Industry

REPUBLIC
Combustion Control Systems

AN automatic combustion control system, as designed and built by Republic, will enable you to operate your boiler (or boilers) over a long period at test efficiencies regardless of variations in fuel, load and other operating factors.

Republic combustion control is a unified system controlling the fuel and air supply to the boiler in the correct amount to maintain constant steam pressure and in the correct ratio to maintain maximum combustion efficiency.

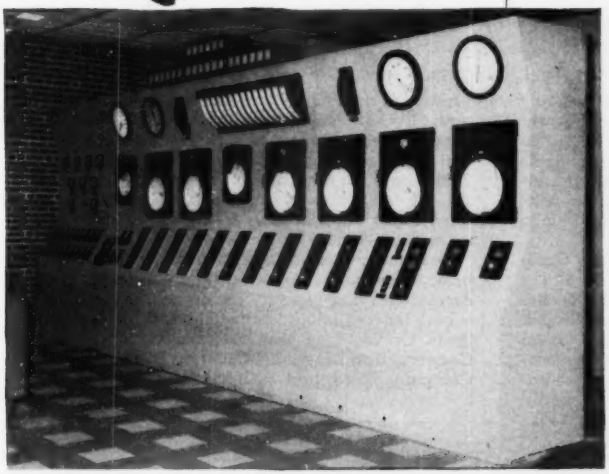
Republic automatic combustion control systems, either pneumatic or hydraulic, are available for all sizes of boilers, all types of fuel firing, and load conditions and any arrangement of draft equipment. They are completely described in Data Book No. S-21—write for your copy.



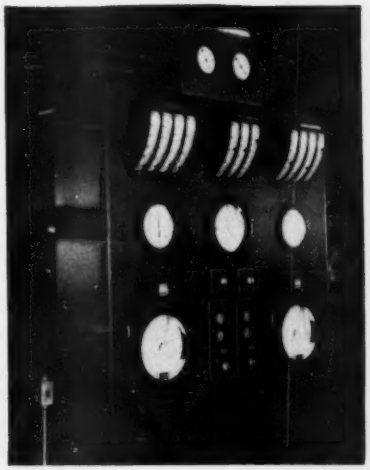
PULVERIZED COAL
In this modern central station steam is generated in two 600,000 lbs. per hr. pulverized coal fired boilers operated by a Republic Combustion Control System.

REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

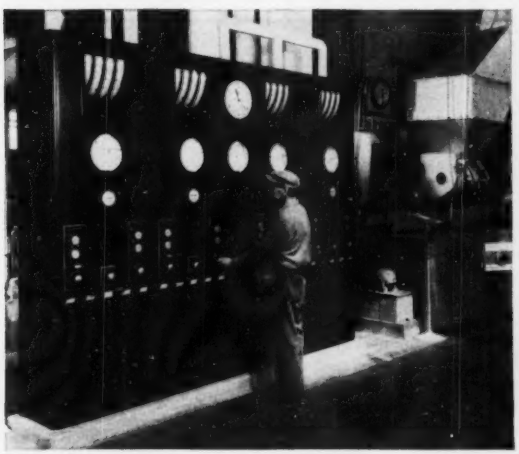
for { All Sizes of Boilers
All Types of Firing
All Arrangements of Draft
All Load Conditions



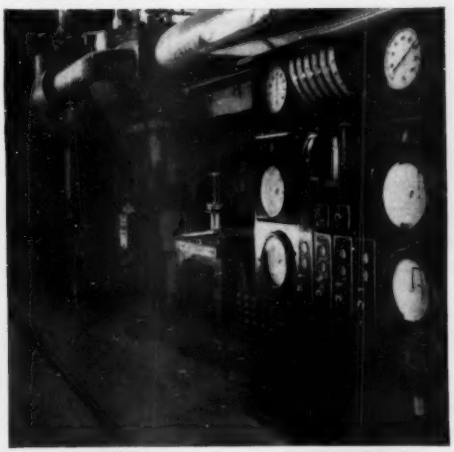
OIL FIRED
A typical Republic automatic boiler control and instrument installation in a large central station for the operation of a 450,000 lb. per hr. oil fired boiler.



MIXED GAS
Republic instrument and controls for two 50,000 lb. per hr. boilers burning mixed gas.



STOKER FIRED
The Republic combustion control and instrument panel for the automatic operation of four 80,000 lb. per hr. stoker fired boilers.



STOKER FIRED
In this modern industrial plant steam is generated in a 175,000 lb. per hr. stoker fired boiler operated by a Republic control system.

NOW... G-E Super Coronol* rated at 85 C copper temperature

NEW HIGHER RATING APPLIES TO ALL SIZES FOR 0- TO 8000-VOLT SERVICE

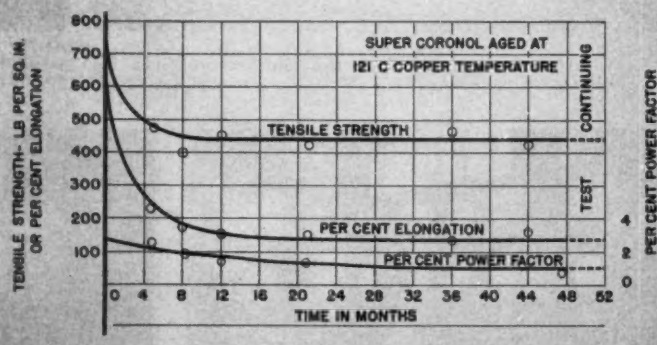
General Electric announces that effective immediately it is basing the ratings of all Super Coronol power cables for service up to and including 8000 volts on a permissible maximum copper temperature of 85 C. To our knowledge this is the highest rating ever announced for a solid dielectric power cable in this voltage range. For voltages above 8000, ratings continue to be based on 80 C.

The new temperature ratings mean that Super Coronol cables are now capable of carrying up to 12 per cent more power, continuously, than old-style ozone-resisting rubber-type compounds rated 75 C maximum.

This higher rating is a conservative increase, based on life tests of many cables taken from regular production. Most severe, and at the same time, most impressive of these tests involves cable held continuously under load at a copper temperature of 121 C. This test is now nearing the end of its 5th year. Both physical and electrical properties have been stable since the 20th month. In view of such results, the new rating is still extremely conservative—*and can safely be applied to all Super Coronol cable now in service at potentials up to 8000 volts.*

G-E cable specialists in your area will be glad to help you calculate just what this new rating means in current-carrying capacity in any specific installation—both for continuous loading and for emergency overloads. Or you may wish to write Section W45-1063, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

This curve shows the results of aging tests on Super Coronol cable to date. The tests are being continued. Note that these results were obtained at a copper temperature of 121 C. Following the rule that insulation life is doubled for every 8-10 C decrease in temperature, the ample factor of safety in the new ratings is obvious.



*Registered Trade-mark General Electric Company

You can put your confidence in—

GENERAL ELECTRIC

Single conductor-Geoprene jacket | Single conductor shielded Geoprene | Pre-assembled aerial cable | Mine Power Cable | Two-conductor concentric lighting cable

Engineered

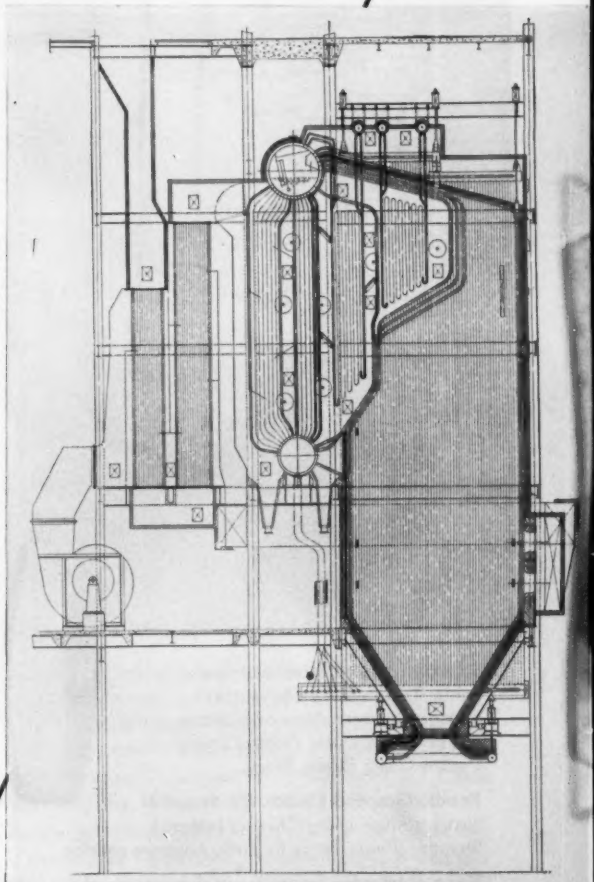
—to stay modern longer!

By consistently providing values that go beyond specifications, Springfield Boiler Co. has earned for itself a record of building steam generating units that *last longer, stay modern longer!* One of these important values is the soundness of engineering underlying Springfield designs. Long a leader in developing and pioneering advances in boiler design, Springfield engineering is balanced by a sense of responsibility that has come from a vast background of experience and more than sixty years of specialization in the boiler field.

Springfield produces a complete range of steam generating equipment . . . ANY SIZE . . . ANY PRESSURE . . . ANY TEMPERATURE . . . AND FOR ANY FUEL. Your inquiry will receive prompt attention. See our nearest representative or write.

SPRINGFIELD BOILER CO.
1953 E. Capitol Avenue
Springfield • Illinois

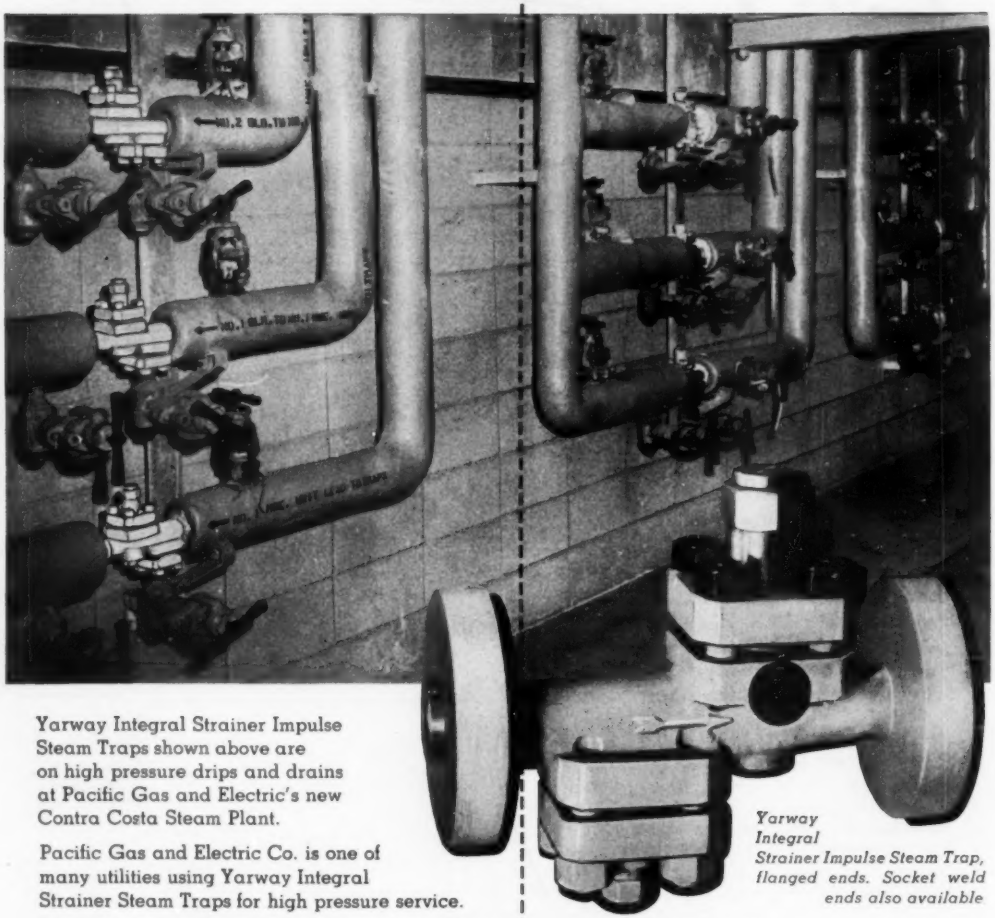
BENT TUBE BOILERS • STRAIGHT TUBE BOILERS
SUPERHEATERS • DESUPERHEATERS • AIR HEATERS
ECONOMIZERS • PACKAGE BOILERS



A Springfield Installation
UNIT CAPACITY—160,000 lbs. per hour.
OPERATING PRESSURE—875 psig.
STEAM TEMPERATURE—900° F. (controlled from 120,000 lbs.)
FUEL—Gas and oil. Future, pulverized coal.

SPRINGFIELD Steam Generating Units

trapping high pressure drips and drains at P. G. and E.



Yarway Integral Strainer Impulse Steam Trap, flanged ends. Socket weld ends also available

Yarway Integral Strainer Impulse Steam Traps shown above are on high pressure drips and drains at Pacific Gas and Electric's new Contra Costa Steam Plant.

Pacific Gas and Electric Co. is one of many utilities using Yarway Integral Strainer Steam Traps for high pressure service.

Yarway Impulse Steam Traps drain some of the hottest steam lines in the country . . . and meet all requirements on pressures up to 1500 psi. They have ample capacity when system is being "warmed up"—yet will handle relatively small amounts of high temperature condensate without losing prime. In presence of dry or superheated steam, the trap valve closes.

Small size simplifies installation. No special supports needed (see picture).
Easy maintenance—only one moving part.
For full details, send for Yarway Bulletin T-1740.

YARNALL-WARING COMPANY • 100 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY impulse steam trap

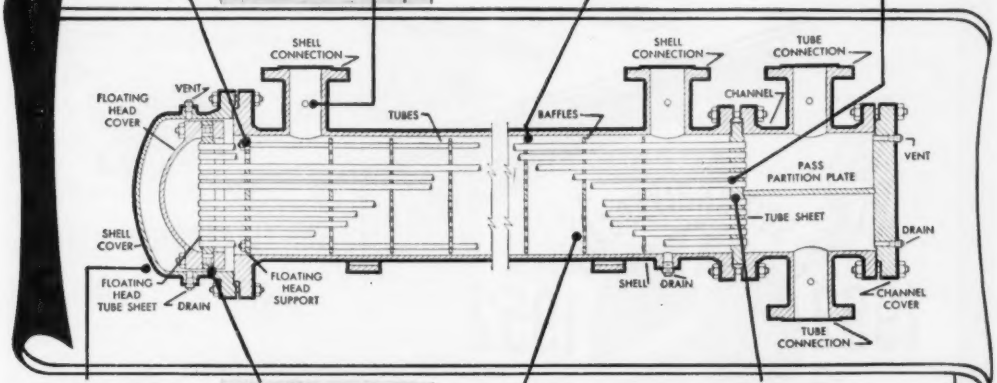
HEAT EXCHANGER EFFICIENCY starts with SUPERIOR DESIGN

"Do-Nut" shape support plate offers maximum support to the floating head without undue strain on the tubes, and tube surface loss.

Connection for pressure gauge and thermometer provided on all flanged connections.

Baffles — cross flow segmental type machine cut and drilled. Close tolerances assure maximum heat transfer.

Tubes — expanded into tube sheets by means of electronic controlled roller expanders, tubes cannot be over expanded or work hardened.



Removable shell cover for easy access to floating head.

"Knock-down" Type floating head. Use of floating head minimizes thermal expansion strains.

All baffles exactly spaced and solidly bolted together with heavy tie rods and spacers.

Ample thickness tube sheet to prevent undue deflection at pass partition plate.

The features of design which make a heat exchanger good are the features which contribute most to efficient, long-lived, trouble-free performance *under your operating conditions*. Since operating conditions are seldom exactly duplicated, industrial heat exchangers are usually custom-built . . . and design characteristics are different for each application.

But while design characteristics differ, the fundamentals of good heat exchanger construction never change. If you are considering the purchase of heat exchanger equipment, we welcome the opportunity of showing you how SUPERIOR Heat Exchangers combine tested fundamentals with design features that fit your use . . . for performance you can BANK on.

Write for your copy of catalog 501

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N.Y.

SUPERIOR HEAT EXCHANGERS

By golly!...We're 50!

50th ANNIVERSARY
1902 1952
STEEL and TUBES DIVISION

ELECTRUNITE TUBING

And you'd scarcely believe the improvements we've made in welded steel tubing since 1902.

Over 30 years ago, the famous ELECTRUNITE process of electric welding replaced the old-fashioned brazed and gas-welded methods. Today, every foot of length, every inch of circumference in an ELECTRUNITE tubular product is equally strong, equally resistant to corrosion, equally smooth and round.

We've improved techniques and added many products to the ELECTRUNITE line, too. At right you'll see examples of all the products we make at our big, modern plants in Cleveland and Elyria, Ohio, Brooklyn, New York, and Ferndale, Michigan.

ELECTRUNITE tubular steel products help many industries make things stronger . . . or lighter to move . . . or attractive longer . . . or safer . . . and at lower cost.

These first 50 years are only a start on new and wonderful developments in ELECTRUNITE Stainless and Carbon Tubing for mechanical and pressure applications," Inch-Marked®" E.M.T. and Conduit for electrical installations.

The ELECTRUNITE Line

"Inch-Marked" E.M.T.., Electrical Metallic Tubing . . . light, strong steel tubing raceway to protect electrical wires against fire, moisture, and impact.

Mechanical Carbon Steel Tubing . . . made in a wide range of grades, sizes, and wall thicknesses to make all types of products lighter, stronger.

"Dekoron-Coated" E.M.T. for complete, longer-lived protection of wires in highly corrosive atmospheres.

Stainless Steel Tubing and Pipe in a full range of sizes, types and wall thicknesses for chemical and food processing equipment, and mechanical applications.

Rigid Conduit . . . heavy-wall steel protection for wires in explosive and hazardous locations.

Heat Exchanger Tubes, both carbon and stainless steel, for all types of heat exchangers, condensers, process equipment, and heaters.

Boiler Tubes for large boilers or small, high pressures or low.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st STREET • CLEVELAND 8, OHIO

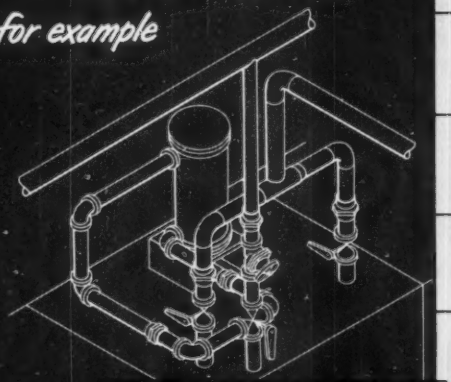
SEE US AT BOOTH 13, POWER SHOW DEC. 1—6

REPUBLIC STEEL

Republic ELECTRUNITE

Are Your Valves Behaving This Well?

...on River Water, for example



THE INSTALLATION

Crane Iron Body Diaphragm Valves on hydraulic lines to cylinder operators on ash pit gates; Southwark Station; Philadelphia Electric Company.

VALVE SERVICE RATINGS

SUITABILITY: Good design for gritty fluid

FEATURES: Neoprene disc insert resists cutting

MAINTENANCE COST: Making big savings here

SERVICE LIFE: Already 6 to 9 times longer than other valves

CORROSION-RESISTANCE: O.K. no sign of corrosion

PRICE: Better than many ordinary valves

AVAILABILITY: Regular number in Crane line

THE HISTORY

Valves were installed in the hydraulic system when the control cocks failed to shut off tight. But like the cocks, conventional valves put in this service didn't stand up. They couldn't handle the abrasive, sandy river water used for hydraulic operators as well as for ash pit sluicing. They leaked badly in 3 to 5 weeks; had to be replaced.

The problem was solved with Crane Iron Body Diaphragm Valves. Installed more than 7 months, there's been no leakage since; no valve trouble of any kind. The Neoprene disc insert and wide, flat seating surfaces in Crane Valves show no effect of abrasion. Their completely sealed bonnet keeps working parts free of grit.

THE VALVE

In Crane Packless Iron Body Diaphragm Valves, the Neoprene diaphragm acts as bonnet seal only; is not subject to crushing and rapid wear. Separate disc with Neoprene insert shuts off flow even should diaphragm fail. Made unlined or with full Neoprene body lining. Well suited for erosive fluids, sludges, slurries; also for many corrosive services. See your Crane Catalog or call your Crane Representative.

The Complete Crane Line Meets All Valve Needs. That's Why

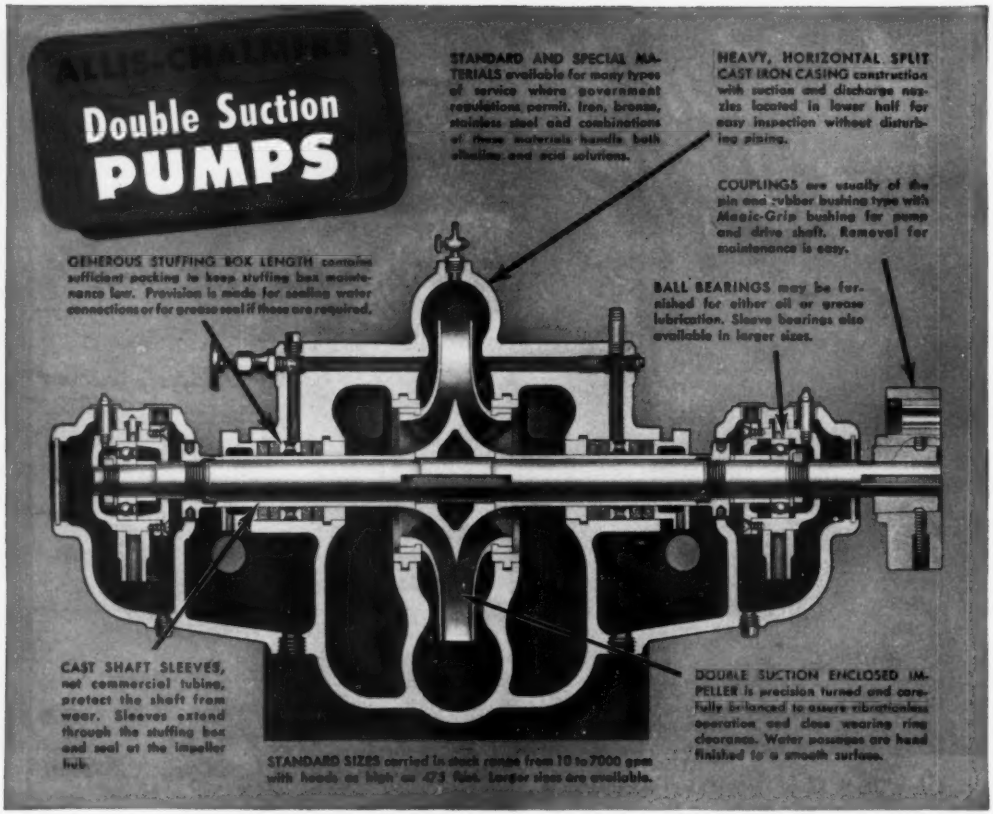
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING


ALLIS-CHALMERS
Double Suction
PUMPS
STANDARD AND SPECIAL MATERIALS available for many types of service where government regulations permit. Iron, bronze, stainless steel and combinations of these materials handle both alkaline and acid solutions.
HEAVY, HORIZONTAL SPLIT CAST IRON CASING construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.
COUPLINGS are usually of the pin and rubber bushing type with Magic-Grip bushing for pump and drive shaft. Removal for maintenance is easy.
GENEROUS STUFFING BOX LENGTH contains sufficient packing to keep stuffing box maintenance low. Provision is made for sealing water connections or for grease seal if these are required.
BALL BEARINGS may be furnished for either oil or grease lubrication. Sleeve bearings also available in larger sizes.
CAST SHAFT SLEEVES, not commercial tubing, protect the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.
DOUBLE SUCTION ENCLOSED IMPELLER is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.
STANDARD SIZES carried in stock range from 10 to 7000 gpm with heads as high as 475 feet. Larger sizes are available.

Built for LONG LIFE

HEAVY DUTY CONSTRUCTION—no skimping, no corner cutting—is what you can look for in Allis-Chalmers Type S pumps. Extra metal thicknesses, extra strong parts, extra construction features, and extra careful workmanship are always there to give you long life, low maintenance and low cost per gallon pumped.

Every Allis-Chalmers double suction pump is carefully tested on the most modern pump testing equipment in the industry. Each installation is individually engineered by men whose experience in thousands of pump installations will give exactly the right pump for your needs.

Allis-Chalmers can take full responsibility for your pumping operation because Allis-Chalmers can furnish the complete installation — pump, motor, control and drive—all built of coordinated design by one manufacturer. Efficient operation is assured and maintenance costs are kept low.

Whatever your pumping problem, call your nearby Allis-Chalmers Authorized Dealer or District Office. Or write to Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 08B6146. A-3580

Texrope, Vari-Pitch and Magic-Grip are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

FREE slide films on pump theory, application and maintenance.
Ask your Allis-Chalmers representative.

ALLIS-CHALMERS

"I sure did specify Hagan Automatic Combustion Controls,

and here's why . . . I specified Hagan Combustion Controls because they are accurate. We don't waste fuel with them. They are built to last, too, and they require practically no maintenance."

Dependability is important. So is accuracy. If as little as one per cent of the fuel your boiler uses during its life is wasted, the cost of this wasted fuel can be five, six or seven times the original cost of the control system!

That is why you are *not* saving money if you buy anything less than the best—dependable Hagan Combustion Controls.

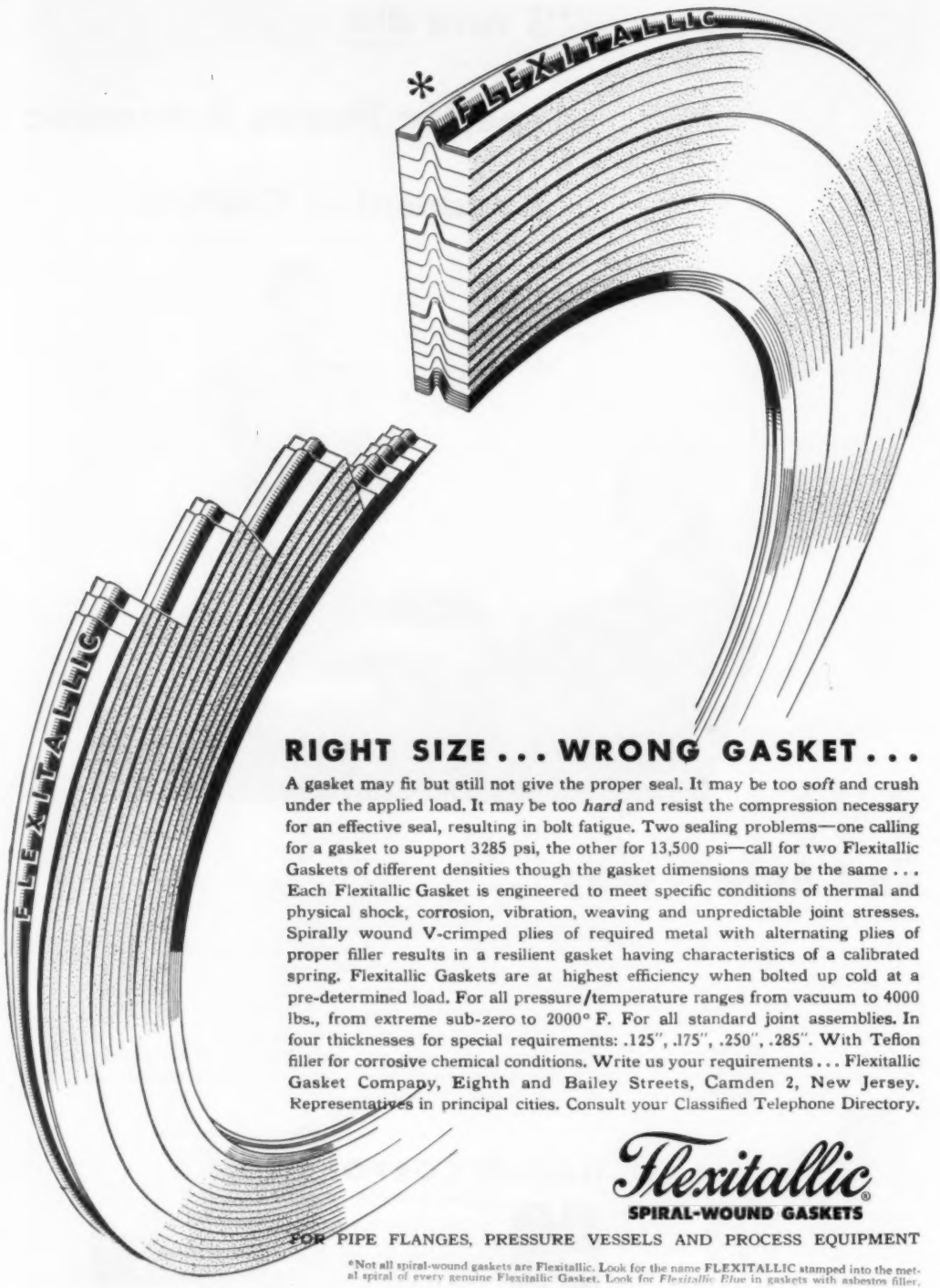
Our engineers are at your service, and will be glad to discuss all types of combustion control applications with you. For full information, write, wire or phone Hagan Corporation.

HAGAN CORPORATION

HAGAN BUILDING, PITTSBURGH 30, PA.

HAGAN HALL BUROMIN CALGON

BOILER COMBUSTION CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
METALLURGICAL FURNACE CONTROL SYSTEMS
CONTROL SYSTEMS FOR AUTOMOTIVE AND
AERONAUTICAL TESTING LABORATORIES



RIGHT SIZE . . . WRONG GASKET . . .

A gasket may fit but still not give the proper seal. It may be too *soft* and crush under the applied load. It may be too ***hard*** and resist the compression necessary for an effective seal, resulting in bolt fatigue. Two sealing problems—one calling for a gasket to support 3285 psi, the other for 13,500 psi—call for two Flexitallic Gaskets of different densities though the gasket dimensions may be the same . . . Each Flexitallic Gasket is engineered to meet specific conditions of thermal and physical shock, corrosion, vibration, weaving and unpredictable joint stresses. Spirally wound V-crimped plies of required metal with alternating plies of proper filler results in a resilient gasket having characteristics of a calibrated spring. Flexitallic Gaskets are at highest efficiency when bolted up cold at a pre-determined load. For all pressure/temperature ranges from vacuum to 4000 lbs., from extreme sub-zero to 2000° F. For all standard joint assemblies. In four thicknesses for special requirements: .125", .175", .250", .285". With Teflon filler for corrosive chemical conditions. Write us your requirements . . . Flexitallic Gasket Company, Eighth and Bailey Streets, Camden 2, New Jersey. Representatives in principal cities. Consult your Classified Telephone Directory.

Flexitallic®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Not all spiral-wound gaskets are Flexitallic. Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket. Look for *Flexitallic Blue* in gaskets with asbestos filler.

The Reader AUDITED PAID ABC CIRCULATION *His Mark*

THE ABC SYMBOL which is printed at the head of this page is, in a very real sense, *your* brand on this magazine. Those letters stand for Audit Bureau of Circulations. The symbol indicates that the magazine is a member and supporter of that Bureau.

To the advertiser who contemplates using the magazine as an advertising medium, this symbol has a well-recognized significance. It tells him that the circulation records and practices of the magazine are wide open to the auditors of the Bureau, who check the publisher's claims and make public the precise terms and conditions under which subscriptions are obtained. And it assures him that the magazine stays in business by virtue of a demonstrated demand from its readers as shown by their paid subscriptions or newsstand purchases.

BUT HERE we are concerned only with the significance of ABC to you as a reader. For when the advertisers, the advertising agencies, and the publishers founded the Bureau nearly forty years ago to help establish honest circulation figures, they unwittingly set up a cooperative institution that has become a major safeguard for the interests of the reading public.

That is because membership in ABC constitutes one of the strongest guarantees that any publication can offer of its primary devotion to the interests of its readers. And by making that guarantee possible, ABC becomes a major safeguard of the freedom of the press, an objective of exceptional importance in these days when the public is flooded with propaganda from so many sources.

THE SUREST MEANS by which to preserve a free press is to keep it directly answerable to the reading public it would serve. It follows, then, that the survival of a truly free press must depend on its acceptance by that public; and that means in turn that the people must have in their hands some adequate means for holding the publishers responsible to them.

No one has yet devised any means to that end more simple, more direct or more practical than the paid subscription or newsstand purchase price. The right to purchase or refrain from purchasing a publication gives to the readers and to no one else the power to pass judgment on whether that publication should continue to serve the reading public.

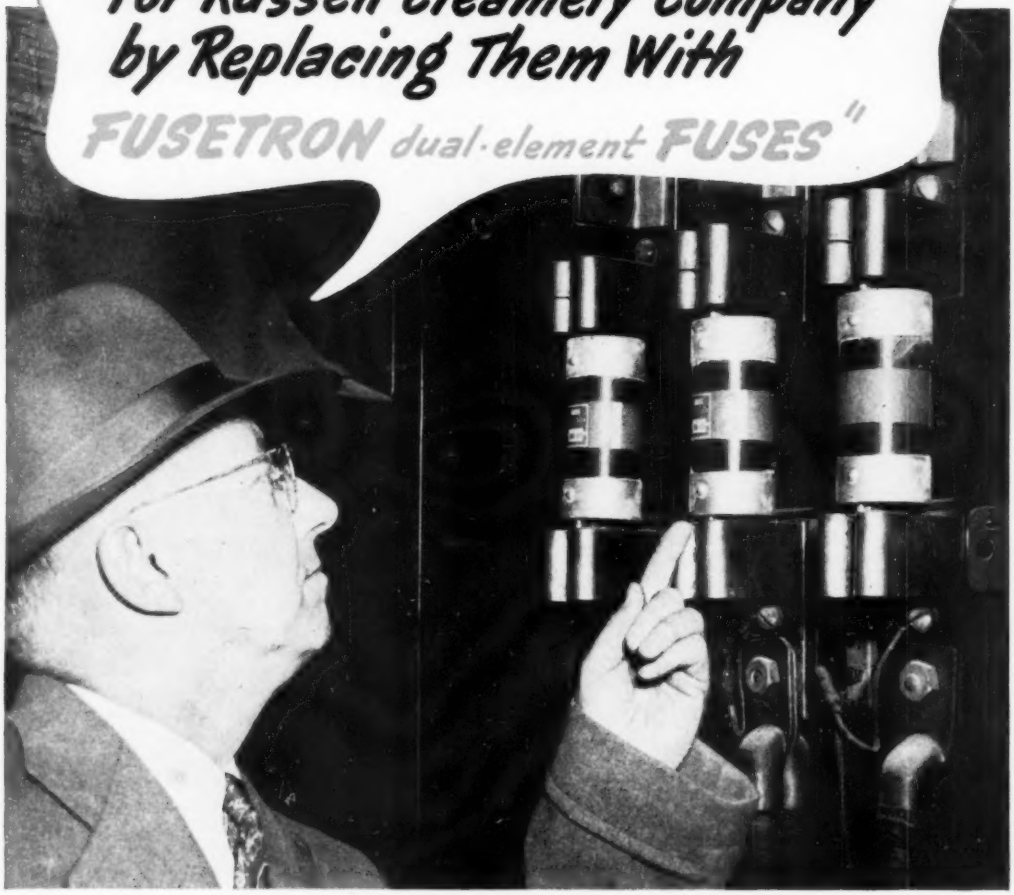
TO SUPERVISE this vital process, to check and certify the integrity of the publication's circulation methods and claims, requires a strict and continuing audit of each publication's success in meeting this test of its public acceptance. To that essential function the ABC has contributed mightily by the conscientious performance of its mission. And that is why we are able to have a press supported, for the most part, by advertising revenues, but not controlled as to its circulation or content by any influence other than its readers.

When an advertiser consults the ABC statement of a publication to ascertain the amount, the quality and the trend of its circulation, he does so in the legitimate pursuit of his own interest. But at the same time, inevitably, he is helping the ABC to keep the press responsible and responsive to the reading public. For, in effect, he is asking the publication to demonstrate through its circulation figures that it owes its standing to a voluntary demand by its readers.

SO THE Audit Bureau of Circulations, by auditing and certifying paid circulations, has come to perform a vital service to the readers of this magazine and of every other member publication. And in performing that service, it helps to maintain in our country a press that is answerable to the reading public and to it alone. So long as the practices and principles for which ABC stands continue to prevail in American publishing, we shall find in it a sure support for a truly free press, responsible only to the public it serves.

McGraw-Hill Publishing Company

"We Stopped Blowing of Main Fuses for Russell Creamery Company by Replacing Them With FUSETRON dual-element FUSES"



and FUSETRON dual-element FUSES provide 10 POINT PROTECTION

1 *Protect against short-circuits.

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexpensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

"...They seem very pleased with our work and we give a good deal of the credit to FUSETRON FUSES!"

ROY SPRINGER, Proprietor
ROSS ELECTRIC CO., Superior, Wisc.

Here are the Details:

"In the fall of 1947 the Russell Creamery Company, largest creamery in Superior, asked us to see what we could do to stop blowing of main fuses. They were having trouble; whenever a main fuse blew the whole creamery was affected.

"We carefully checked the load and found that it was unbalanced but that 600 ampere fuses were the size that should be used.

"The load was balanced and to be sure poor contact was eliminated, the clips in the switch were replaced. Then FUSETRON dual-element Fuses in 600 ampere size were installed.

"Since then Russell Creamery Co. has not had to call us once to replace a main fuse.

"Later Russell Creamery built an addition to their plant. We got the job. It was still not necessary to change the 600 ampere service.

"They seem very pleased with our work and we give a good deal of the credit to Fusetron Fuses."

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Don't Risk Losses

One **needless** shutdown...
One **lost** motor...
One **destroyed** switch or panel
One **burned out** solenoid...

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

MAIL THE COUPON NOW

for complete information about the All-Purpose Protection of FUSETRON Dual-Element FUSES.

BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.

Please send me complete facts about FUSETRON dual-element Fuses.

Name _____

Title _____

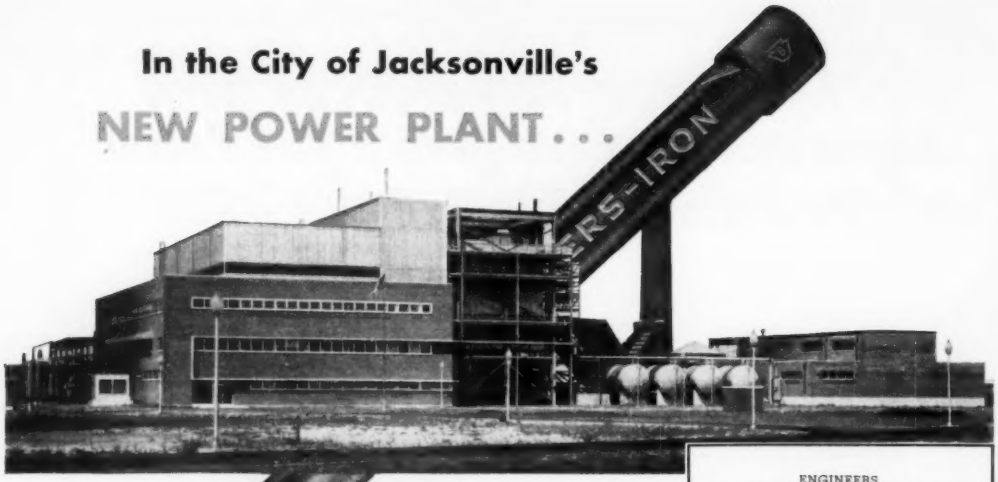
Company _____

Address _____

City & Zone _____ *State* _____ 952

In the City of Jacksonville's

NEW POWER PLANT...



23 services get time-proved BYERS WROUGHT IRON protection

ENGINEERS
Reynolds, Smith and Hills, Jacksonville, Florida.

TANK FABRICATORS
Birmingham Tank Company, Division of Ingalls Iron Works, Birmingham, Alabama.

POWER PIPING INSTALLATION
Benjamin F. Shaw Co., Wilmington, Delaware.

GENERAL CONTRACTOR
George D. Auchter Company, Jacksonville, Florida.

MECHANICAL SUBCONTRACTOR
Henley & Beckwith, Inc., Jacksonville, Florida.

In this new 60,000 KW Plant, built to meet rapidly increasing city requirements, materials were carefully selected to meet service conditions. In 23 varied services facing corrosive hazards, the designers selected genuine wrought iron to forestall the maintenance threat of early failure and costly replacement.

Over 185 tons of Byers Wrought Iron pipe and plate was installed in the following services: condensate storage tanks; surge tanks; raw water holding tanks; fuel oil inspection tanks; boiler water storage tanks; feed water chemical treatment tanks; all domestic hot and cold water lines in the building; interior fire protection system; steam supply piping, condensate returns and hot water circulating lines in connection with the heating and air conditioning systems; all outside fuel oil supply lines; fuel oil steam supply and condensate piping; fuel oil heating coils; all chlorine gas lines; outside small domestic cold water service lines under ground; evaporator blowdown and drain piping in discharge flume; cooling water piping above ground serving main condensers; cooling water piping for turbine oil coolers; cooling water piping for heat exchanger in hydrogen cooling system; and manhole steps for sewer structures.

The selection of genuine wrought iron for these services follows accepted design practice, and is endorsed by performance records that testify to the material's superior corrosion resistance. Write for our bulletin, WROUGHT IRON FOR PIPING SYSTEMS.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unique fibrous structure of genuine wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

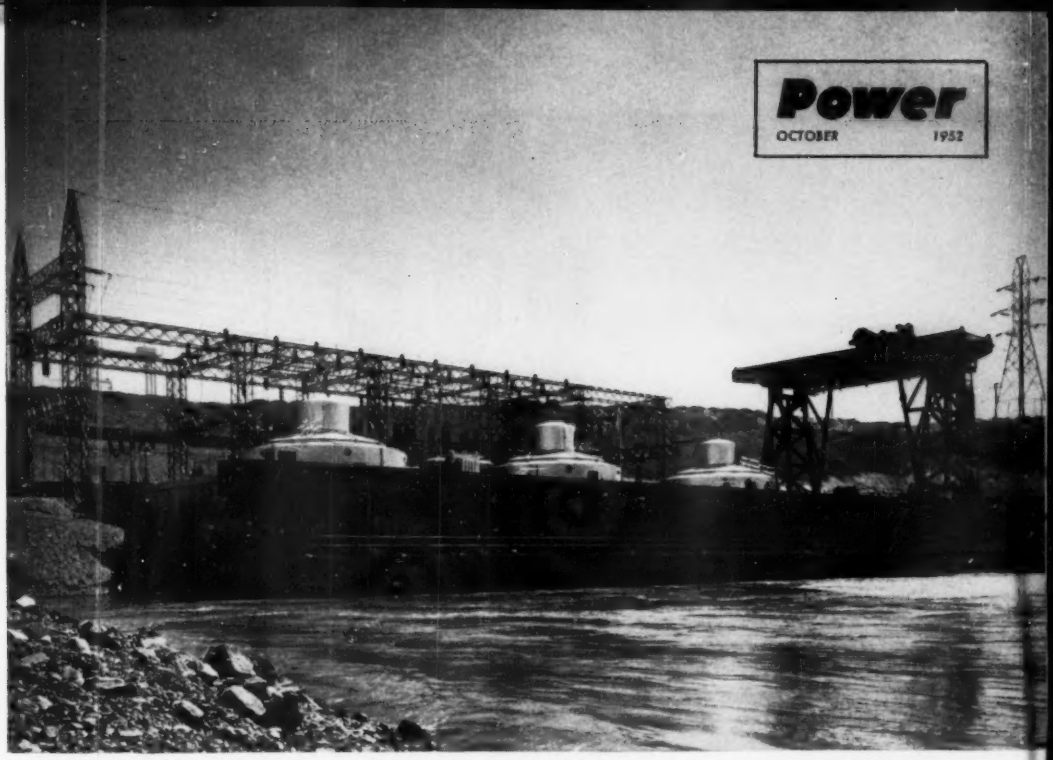
CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Power
OCTOBER 1952



C J STRIKE PLANT on Idaho's Snake River has three 38,000-hp units under 90-ft head. Three penstocks are 22-ft diameter

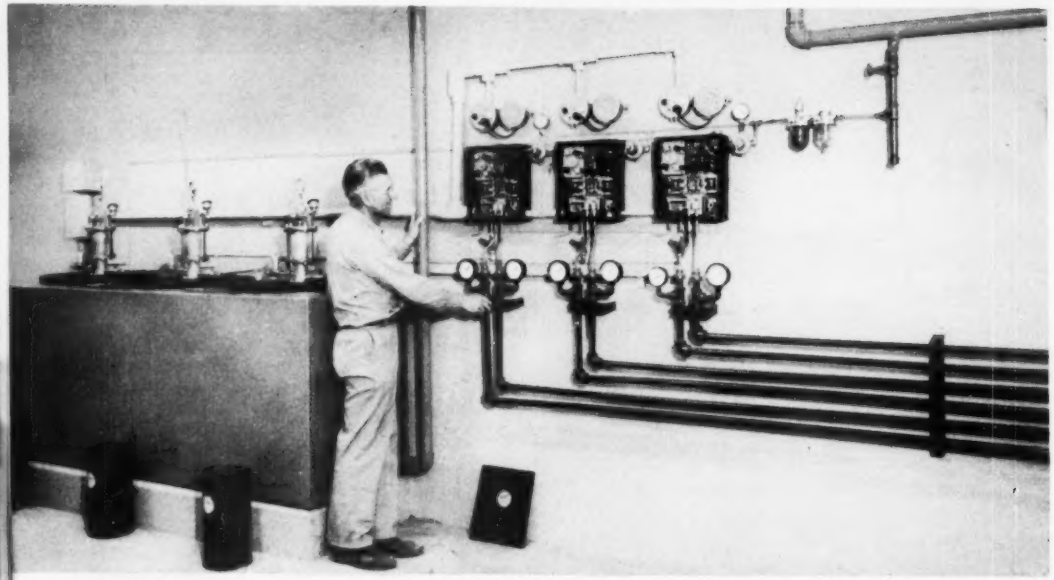
Idaho Hydro Plant Adopts Centralized Lube System...

FLEXIBLE HOSE carries grease from outlet block to measuring valve atop linkage bearing. Blocks fed through ⅜-in. tubing

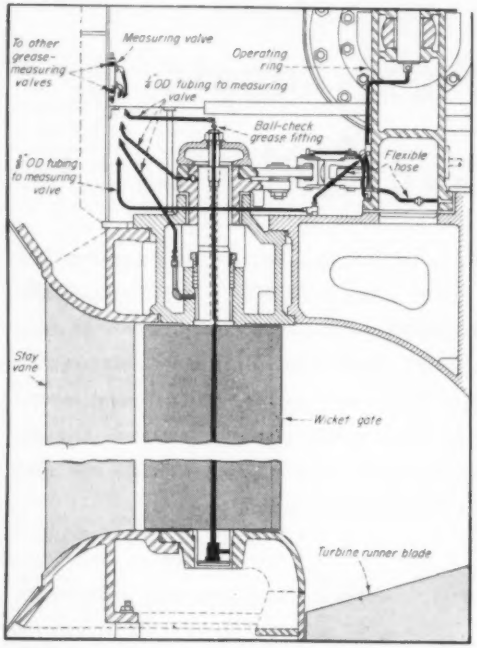
. . . on wicket gate bearings and governor linkage of three 30,000-kw units. Grease under high pressure is forced through bearings every 4 hours. Measuring valves, near bearings, dole out set quantity of lube when timing mechanism sends grease pumps into action. Transfer pump forces grease into inside storage tank from connection outside plant

BY E A WOODHEAD, *Chief Consulting Engineer, Idaho Power Co*

TURN PAGE



HEART OF SYSTEM is grease storage, pumping and timing devices above. Timing mechanisms set grease pumps in action, forcing lubricant through supply lines to measuring valves at bearing points. Each turbine is fed by set of two ¾-in. pipelines



WICKET GATE bearings grease-fed every 4 hr. Lower bearing and packing gland get 0.5 cu in., upper bearing 0.1 cu in.

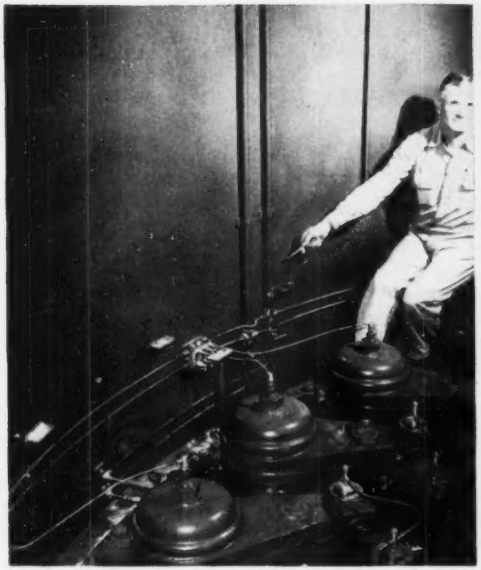
GREASE PIPING RUNS FROM TIMING DEVICES . . .

► CENTRALIZED LUBRICATION has paid off throughout industry in general. It has paid off in better lubrication by applying the proper quantity of lubricant at the proper time. This adds up to longer machine life plus man-power savings; men are released for other work.

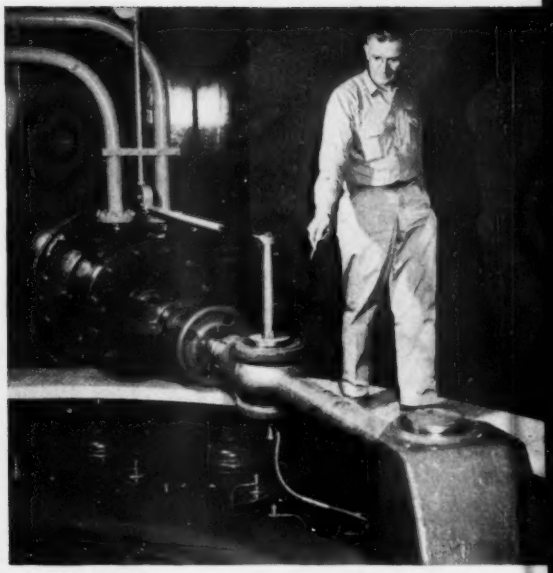
Points Lubricated. Since 1945, the Idaho Power Co has built six hydroelectric stations along the Snake River or nearby tributaries. Two of these stations are completely automatic and unattended. All six are automatically lubricated from a centralized system with a preset lubricating cycle. Likewise at the C J Strike Hydro Plant, centralized lubrication was adopted on governor mechanism and wicket gates.

Falling back on experience gained in above plants and the Twin Falls Plant (built in 1935) we've found a high lube pressure is needed to effectively lubricate the wicket gate and governor bearings. Maximum pressure of 4000 psi is needed. Small bearing-clearances, frequent lubrication, small yet exact quantities of lube all lengthen bearing life.

The C J Strike Plant has three 30,000-kw units. By January 1952, construc-



MEASURING VALVES, fed from main grease headers, dole out set amount of lube when timing mechanism starts grease pump



CONNECTING ROD knuckle bearing fed through flexible hose. Each turbine has 148 points lubricated by centralized system

. . . IN STORAGE AREA TO TURBINE PITS, THEN TIES TO BRANCH LINES FEEDING MEASURING VALVES

tion, started in November 1950, had been completed, and plant was in operation. The earth dam with clay core has a concrete spillway structure with a capacity of 100,000 cfs. There are three 22-ft-dia steel penstocks working with a 90-ft head. Power generated is used in the Snake River valley primarily for domestic and farm service.

Each of the three turbines has 148 points lubricated by a centralized system. Lube points on each turbine are:

24 lower wicket-gate bearings
24 upper wicket-gate bearings
24 upper wicket-gate packing glands
48 gate connecting-link bearings
24 points on operating ring
4 servomotor connecting links

Three air pumps, their timing devices and warning signals are located centrally along the plant's downstream wall. These pumps are fed from one grease-supply tank measuring 3 ft x 2 ft 5 in. x 7 ft 3 in. This tank is filled by a transfer pump through a 2-in. line from outside the plant.

Grease used must meet the following general requirements: (1) High resistance to water washing (2) not easily water-emulsified (3) worked penetration around 295-340 at 77 F (4) dropping point from 165 to 200 F (5) viscosity about 1000 ssu at 100 F (6) viscosity about 100 ssu at 210 F (7) pumpable at 32 F on outdoor systems.

Lube Piping. Two ¾-in. supply lines run from each timing device to the turbine pits. Two ⅜-in. OD lines tie into this supply and extend around periphery of pit liners to feed grease measuring valves for wicket-gate bearings. In addition, two ⅜-in. OD lines cross under walkway, and circle outer periphery of operating ring to remaining valves.

Lines, which extend in both directions from the ¾-in. header, supply six measuring valves, each having six outlets. Both of these lines terminate in line-pressure switches. Each measuring valve lubricates two wicket gates. Valves are adjusted so lower gate bearing and packing gland receive 0.500 cu in. of grease, upper gate bearing 0.100 cu in., every 4 hr.

Now let's follow through the remaining two ⅜-in. OD lines that cross under walkway from the header. They diverge at the operating ring and extend in a single line in each direction halfway around the ring's outer periphery. Each of these lines passes through five *4-outlet* blocks and one *6-outlet* block. Two ¼-in. lines run from each of the *4-outlet* blocks to feed inner and outer bearing surfaces of the operating ring through individual measuring valves. These are adjusted to discharge 0.015 cu in. of grease. Each of the remaining outlets on the *4-outlet* blocks feed through flexible ¼-in. hose to the connecting link of one wicket gate. Each single flexible hose connects first to a through-type measuring valve on one end of the connecting link and from there to a deadend valve at the other end of link.

The *6-outlet* blocks handle a similar load in addition to the two servomotor connecting links.

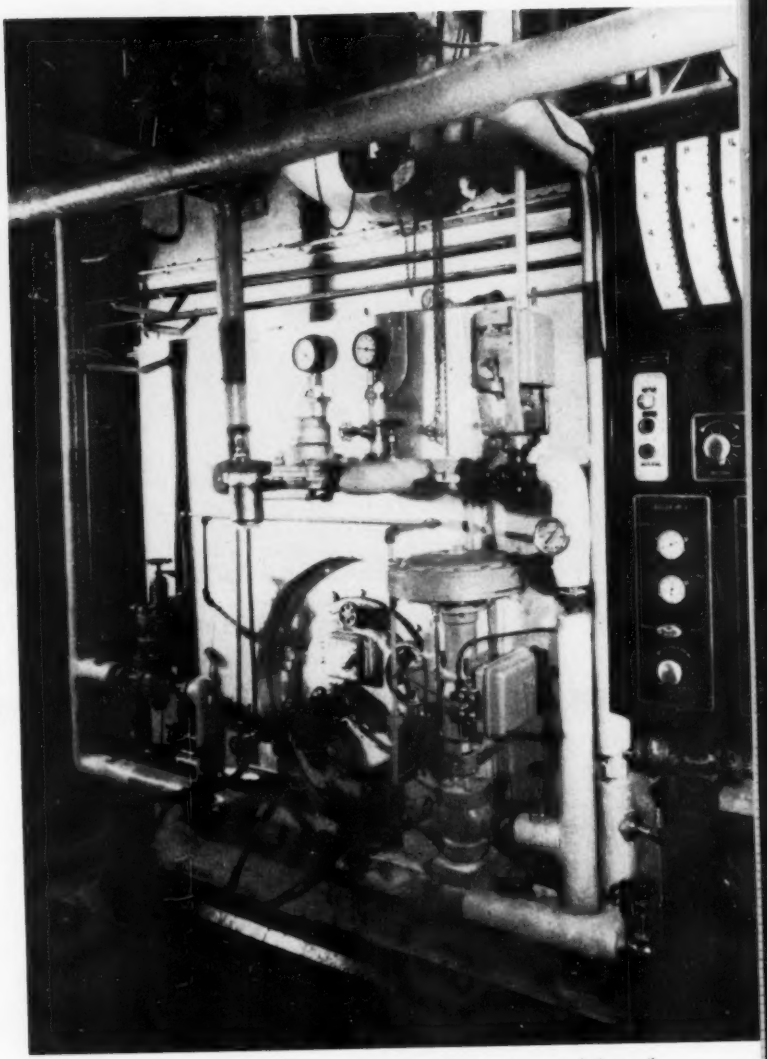
With the exception of the wicket-gate bearings mentioned above, the remaining points are lubricated once a week. This is handled through valves in the supply lines feeding these points.

The plant was designed by Ebasco Services Inc. The centralized lubricating system was supplied by the Alemite Division of Stewart-Warner Corp.

Boiler Room Takes On Double Role

CO_2 in boiler flue gas can be led direct to carbonating tanks in the latest magnesia insulation-making process. Here's how the needs of boiler and process are met efficiently

By R M KINSEY
General Works Manager
Ehret Magnesia Mfg Co
and E W WINCHESTER
Project Manager, The Kuljian Corp



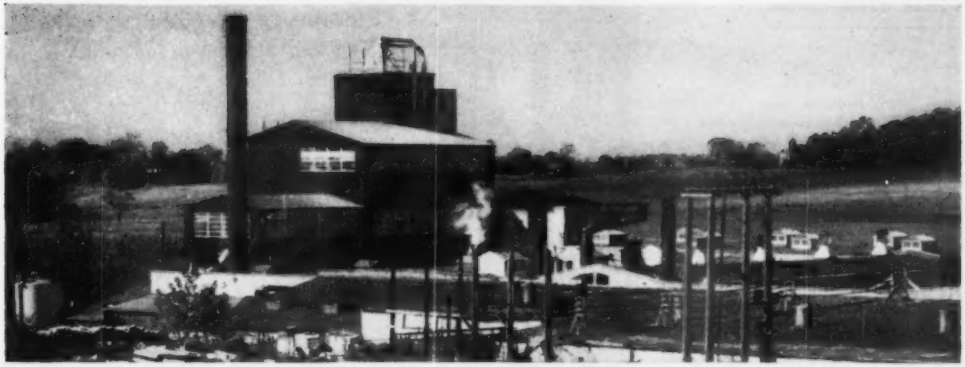
1 Heart of the steam supply and source of process CO_2 is a battery of three oil-fired, 300-psig, saturated, 12,500-lb-per-hr-capacity boilers in the plant basement

► In 1949, Ehret Magnesia Mfg Co. of Valley Forge, Pa., decided to revamp its entire process plant to take advantage of the latest manufacturing techniques in magnesia insulation production, Fig. 2. These techniques require a heavy use of power equipment, and involve this double duty for the boilers: (1) They supply all the steam for process, and (2) they provide ample 10 to 12% CO_2 gas to the carbonating tanks.

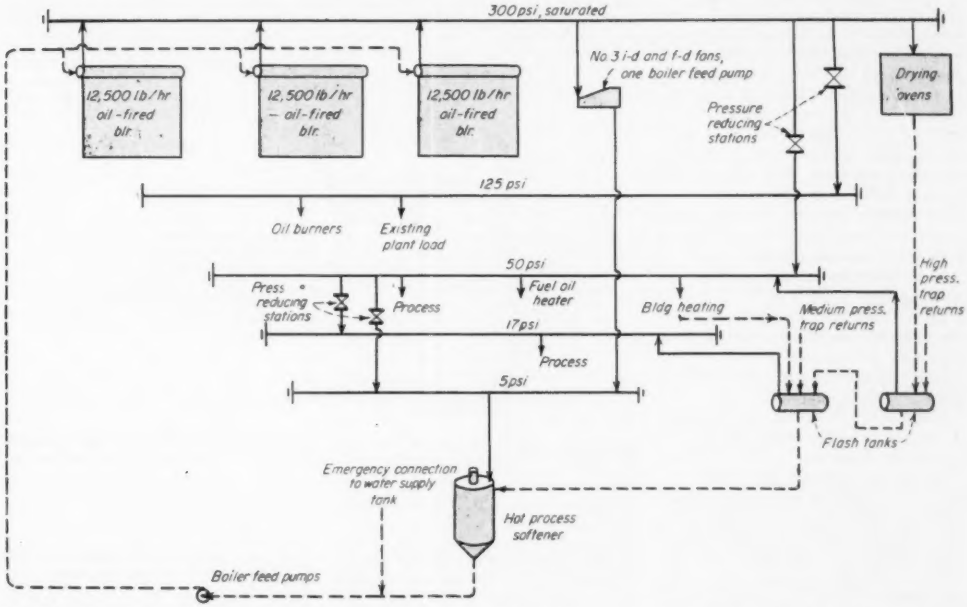
The task of working out design particulars from process to power was assigned to the Kuljian Corp, plant designers and constructors, of Philadelphia.

Power Needs. The previous plant layout met its electric power needs with a bank of three 200-kva single-phase transformers tied into the Philadelphia Electric Co's distribution system, plus two 220-v generators—a 375-kw and a 300-kw one—connected in parallel to the purchased-power supply.

The new process system called for a greatly expanded total electrical load. With some allowance for further growth it required about 1500 kva of capacity. Faced with such a sharp load growth and with attractive power rates for 33,000-v energy purchase available from the local utility, The Kuljian Corp decided it was more economical to pur-



2 New process employs so much special mechanical equipment, controls over material handling and weighing that plant owners, Ehret Magnesia Co, greatly revamped power system, tapped boiler flue gas for process CO_2 by method in Fig. 5



3 This steam-water cycle gives flexible supply with oversized softener tank doubling as a retention basin to give a low turbidity water. All possible condensate is returned to where makeup averages 15%, but sometimes it reaches to 40%

chase than to generate all power needs.

How about fitting existing electrical equipment into a new 33,000-v purchased power supply? All motors had run at 220 v and for this reason 220 v came in for first consideration as the plant distribution voltage. But with the new large motors and heavy loads, 480 v offered much better regulation. So a plan was worked out to use 480 v, and still keep the existing 220-v motors.

The old 2400-480/240-v transformer bank secondary was pressed into service as an autotransformer. It supplies the former 220-v load and saves the replacement costs for this older equipment.

The new 1500-kva transformer bank (three 500-kva single-phase oil-immersed transformers, 33,000 delta to 480-v delta) connects to a 2000-amp breaker on a 3-feeder metal-enclosed drawout-type switchgear. First feeder goes to the distribution switchgear in the new process building; second to two motor-control centers in a dryer building, and the third to the finishing and packaging building.

Each motor in the plant connects to a combination magnetic starter with a circuit breaker. To make testing and maintenance of molding process control motors easy, individual pushbutton-

have been mounted, along with both timer and timer start-stop switches on an operator's panel at the working floor level.

Steam Supply. Under the new design, chief users of steam, Fig. 3, are the product-drying ovens. Each requires 10,000 lb per hr of saturated steam at 300 psig. At peak plant output both ovens operate at the same time.

Heart of the steam supply is a battery of three oil-fired 12,500-lb-per-hr boilers delivering saturated steam at 300 psig, Fig. 1. The fuel oil (bunker C) for these units comes from a tank farm made up of three 30,000-gal horizontal tanks that together hold a month's supply under peak steaming rates. These tanks stand on a little hill above the boiler room and afford a positive 30-ft suction head to the pump-heater sets.

A 1½-in.-thick magnesia block insulates the tanks and, together with a vent in the suction header, can keep the oil fluid throughout the year without any help from tank coils at all. Special facilities in the way of steam lines, transfer pumps have been set up to move oil from the delivery trucks or tank cars into their storage tanks.

Each boiler has a lighting-off burner working from a No. 1 or No. 2 fuel-oil supply. Once the bunker-C oil from the preheater set reaches operating temperature, the regular steam-atomizing oil burners go into service and the lighting-off burner is cut out.

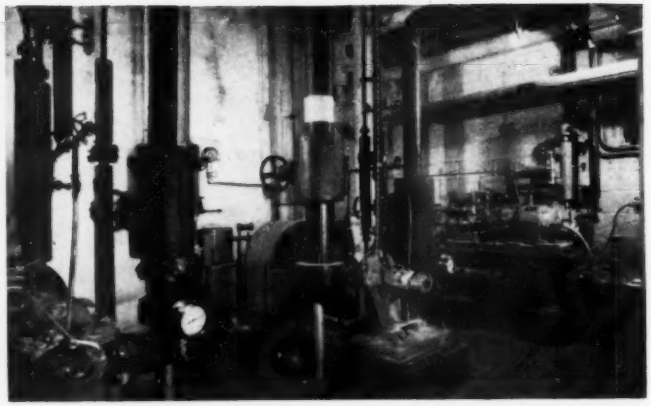
Steam-water cycle, Fig. 3, embodies a number of engineering aids to good operation. A hot-process lime-and-soda treatment on incoming raw water produces the desired softness. Normal plant operation calls for only about 15% makeup with a maximum of about 40%. Result is a softener tank oversized for normal operation. This oversize equips the tank to double as a retention basin so softened water meant for the boiler-cycle can settle out for as much as 1½ hr. This feature gives a water of suitably low turbidity so filters need not be used at all. In addition, the softener tank carries a built-in deaerator with storage space for a 10-min supply of deaerated water.

The softener tank assembly mounts enough above boiler-room level so the drums can be filled by gravity. This pressure head permits holding pressures up to 10 psig within the deaerator without danger of the feedwater flashing in the boiler feed pumps.

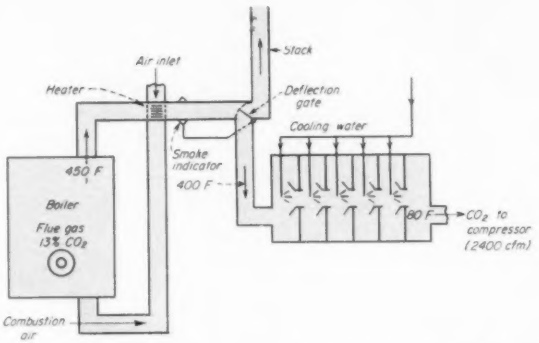
These boiler feed pumps, Fig. 4, presented an initial selection problem because they called for an unusual head and a low capacity. The choice has worked out admirably. These pumps possess a very level output curve between no load and peak load. One is motor driven and the second turbine driven. Turbine speed suffers so little from load swings that no noticeable change in pump discharge pressure occurs, and accordingly the usual pressure regulator was omitted.

Steam leaves the boilers at 300 psig, saturated, Fig. 3, and serves the major steam loads,—the drying ovens—one boiler feed pump, a f-d and an i-d fan, then through reducing valves to a 125-psi, a 50-psi and a 17-psi level. The 125-psi level feeds the existing plant load plus the steam-atomizing oil burners and the hot-process softeners. The 50-psi level, aided by flash steam from a 50-psi flash tank, supplies building heating, fuel-oil heaters, process; the 17-psi level helped by its flash tank handles process needs only; exhaust from turbines driving boiler feed pumps, i-d and f-d fans, supplies heat to the hot process softener.

The 300-psi drying oven load is a highly interesting one. Heat for it is delivered by hot air forced over steam-heating coils by motor-driven fans. Oven temperatures are observed at various stations by 16-point recording pyrometers and checked at critical locations by three indicating thermometers. Minimum allowable oven temperature to



4 Boiler feed pumps receive their water from built-in deaerator in the softener. This unit stands high enough to give the pumps a positive 30-ft suction head



5 At the foot of the stack, Fig. 2, in an L-shaped steel box, five gas scrubber units in series clean a portion of the flue gas to give up CO_2 for process use

PRINCIPAL BOILER-HOUSE EQUIPMENT

Ehret Magnesia Manufacturing Co, Valley Forge, Pa.

STEAM-GENERATING EQUIPMENT:

Boilers, 3 ..... E Keeler Co
Each 12,500 lb per hour continuous, 300 psig saturated steam, two drums, 1750 sq ft heating surface, furnace for 23,000 Btu per hr per cu ft heat release, suited for bunker C oil firing, 175 hp Keeler type CP
Oil burners, 3 ..... E Keeler Co
1 each boiler, steam-atomized forced-draft burner
Air preheaters, 3 ..... E Keeler Co
1 each boiler, equipped with Diamond type G9B soot blowers
Soot blowers, 3 ..... Diamond Power Spec Corp
1 each boiler, rotating steam, Diamond type G2CS
Forced-draft fans, 3 ..... L J Wing Mfg Co
4450 cfm, 4.5 in.
Motor-drive forced-draft fans, 2 ..... Star Electric Motor Co
5 hp, 1750 rpm, 440 v, 3 phase, 60 cycle
Turbine-drive forced-draft fan, 1 ..... L J Wing Mfg Co
300-psig throttle; 5-psig exhaust
Induced-draft fans, 3 ..... Prat-Daniel Corp
Motor-drive induced-draft fans, 2 ..... General Electric Co
7½-hp, 1800-rpm, 440-v, 3-phase, 60-cycle TEFC enclosure
Turbine-drive induced-draft fan, 1 ..... Coppus Engrg Corp
300-psig throttle, 5-psig exhaust
Steel stack, 1 ..... McCarter Iron Works, Inc
Self-supporting, 85 ft high, 5 ft diameter
Scrubber housing, 1 ..... Keenan Co
Ducts and breeching—air and gas ..... Keenan Co
Combustion controls and instruments ..... Republic Flow Meters Co

FEEDWATER EQUIPMENT:

Boiler feed pumps, 2 ..... Allis-Chalmers Co
3500 rpm, 80 gpm, 850-ft head, delivered, 227 F water, 0.953 specific gravity
Motor-drive boiler feed pump, 1 ..... General Electric Co
50 hp, 3500 rpm, 440 v, 3 phase, 60 cycle
Turbine-drive, boiler feed pump, 1 ..... Elliott Co
45 hp, single stage, 3500 rpm, 300-psig throttle, 5-psig exhaust
Feedwater regulators, 3 ..... Bailey Meter Co
Thermo-hydraulic generator unit, 300 psig
Water softener, 1 ..... American Water Softener Co
Electromagnetic hot-process combination lime-soda unit

FUEL-OIL EQUIPMENT:

Storage tanks, fuel oil, 3 ..... Buffalo Tank Corp
3 at 30,000 gallons, each
Suction heater's fuel-oil tanks, 3 ..... Griscom Russell Co
Insert type, each 6 gpm, bunker C fuel oil, 1800 ssu viscosity, at 122 F, heating from 40 to 100 F with 84 lb steam per hr at 50 psig
Transfer pumps, fuel oil ..... Aurora Pump Co
Truck transfer pump, 1, 100 gpm, 22 psig, 5-hp motor, 440 v, 3 phase, 60 cycle, splashproof; railroad transfer pump, 1, 30 gpm, 55 psig, 5-hp motor, 440 v, 3 phase, 60 cycle, splashproof
Pumping and heating set, fuel oil, 1 ..... Faber Engrg Co, Inc
Steam-driven pump, 1, 6 gpm; motor-driven pump, 1, 6 gpm.
Oil heating units, 2, each heating 6 gpm, bunker C fuel oil from 100 to 200 F, with steam at 50 psig

MISCELLANEOUS EQUIPMENT:

Tanks ..... Keenan Co
Blowoff tank, one 100 psig 650 F; 50-lb flash tank, one 75 psig 650 F; 17-lb flash tank, one 25 psig 650 F
Boiler chemical feed:
Duplex pump, 1, each cyl 0-10 gph ..... Milton Roy Co
Phosphate solution at 500 psig discharge
Duplex pump motor 1, 440 v, 3 phase, 60 cycle ..... General Electric Co
Phosphate solution tank, 1 ..... Milton Roy Co
Agitator, 1 phosphate solution tank ..... Milton Roy Co
Agitator motor 1, 440 v, 3 phase, 60 cycle ..... General Electric Co

Meters and instruments ..... Republic Flow Meters Co
Boiler-room piping ..... Benjamin Lessner Co, Inc
Boiler-room pressure gages ..... J E Lonergan Co
Boiler-room thermometers ..... Moeller Instrument Co
Lighting oil pump ..... Tuthill Pump Co
Smoke recorder ..... Brooke Engineering Co

ELECTRICAL EQUIPMENT:

Distribution transformers, 3 ..... Westinghouse Electric Corp
500 kva, type SL, OISC, single phase, 60 cycle, 33,000 primary, 240/480 secondary
Electrical wiring ..... Union Electric Contracting Co

ENGINEERS AND CONSTRUCTORS..The Kuljian Corp, Philadelphia

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evaporate the moisture and dry the product is 400 F. This need set the process pressure level at 300 psig.

Rather than maintain the 400-F temperature level by regulating valves on the steam supply to the coils, a different system was worked out. With it the steam flows through the coils under control of traps alone. Temperature adjustments within the oven result from cutting in or out individual or banks of fans blowing over these coils.

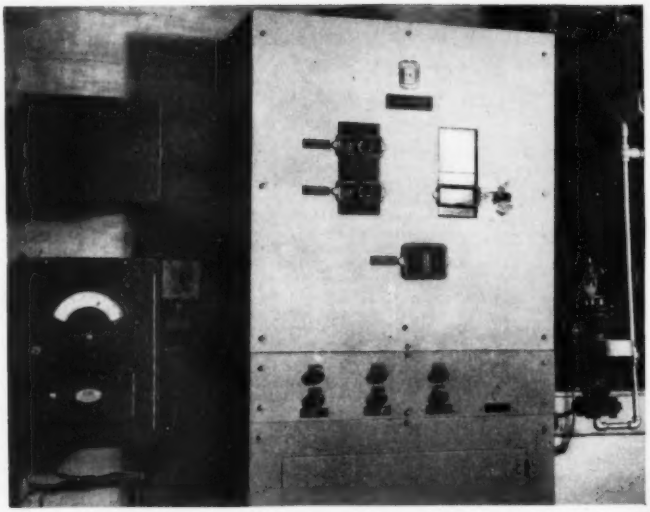
Next, and probably most interesting process service to the power man, is the use of boiler flue gas as a source of CO_2 for carbonating tanks, Fig. 5. A pneumatic combustion-control system employs a master regulator that varies air and steam flow as steam pressure drops and yet maintains maximum CO_2 for process use, consistent, of course, with a clean flue gas and moderate furnace temperatures. Furnace draft holds steady by automatic positioning of the uptake dampers. For very low ranges the shutoff damper on the breeching side of the i-d fan needs manual positioning. If desired, a rating control can take over to proportion load to the separate boilers.

Further, one or more boilers may be locked at any load and the remainder let swing. An interlock permits the fuel feed valve to open only after two fans, i-d and f-d, are operating. Just shutting down the f-d fan closes down the furnace and lets the i-d fan purge it.

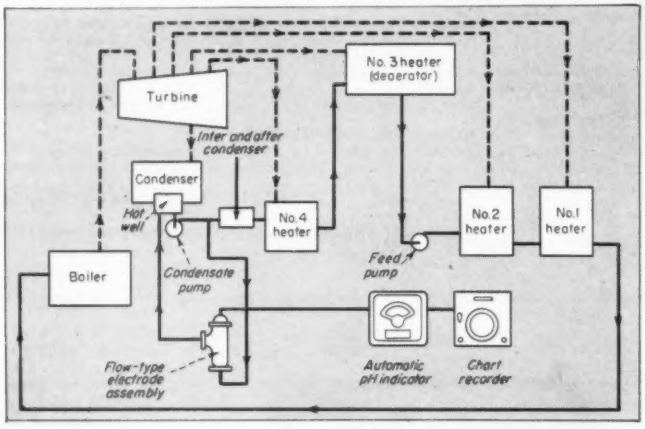
CO_2 control is manually affected by adjusting the fuel-air ratio. A CO_2 recorder that normally analyzes breeching flow may be switched to the gas stream of any one of the three furnaces. Further, a smoke indicator, an alarm and a recorder serve the process gas breeching so this gas flow can be stopped if the smoke density reaches a point that is high enough to offset the color.

Fig. 5 shows how the boiler outlet gas enters the plant process. Furnace gas leaves the boilers at the rear, passes down to a preheater and then up to the i-d fan inlet. These fans are higher-shaft-speed, compact designs normally employed as combination fans and stacks. They discharge into a breeching that runs into a steel stack that is 85 ft high.

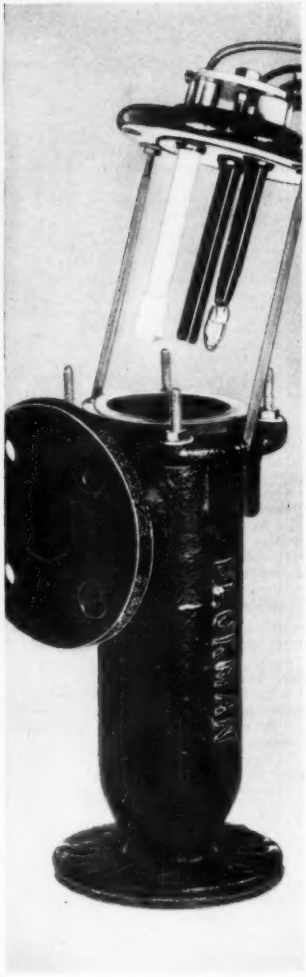
A branch duct, though, ties into this breeching and leads to an L-shaped gas scrubber enclosing the base of the stack on two sides. Scrubber consists of six compartments with three water jets and three gas orifices piercing each partition. The water not only scrubs the gas but it sets up a jet action to keep the gas moving along. Water for the jets comes from the cooling water that is discarded from process. This method gives ample, clear CO_2 ready for use.



1 Flow-type pH assembly, at right of panel above, passes information to pH instrument, left of panel, where it is amplified, indicated and sent to recorder



2 Continuous pH measuring assembly connected into discharge line of condensate pump supplies the needed data to permit pH control by "slugs" of cyclohexylamine

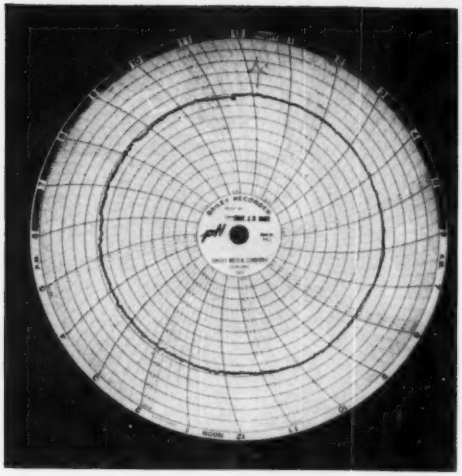


3 Glass and reference electrodes, resistance thermometer, form flow unit

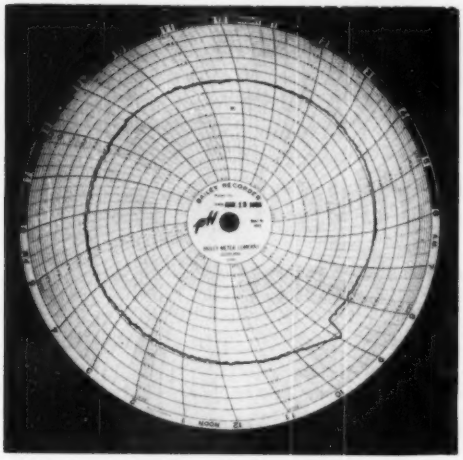
Accurate pH Control Eliminates Corrosion

By **MYRON L CRATER**, *Chief Steam Plant Engineer*
Public Service Dept, City of Glendale, Calif.

► CORROSION CONTROL has always been of major interest to power-plant engineers. This concern develops not only because of the cost and difficulty of cleaning equipment, or even of replacing units ruined for further service, but also because of the losses involved in a failure to meet demand. This latter consideration has been of paramount importance in California, where growth of population and industry has thrown a greater burden on existing capacity than had ever been contemplated.



4 Steady pH readings within a narrow 7.2 to 7.6 band give testimony as to the effectiveness of the control system



5 Sensitive reaction of the pH electrodes shows in pH jump occurring about 8:45 am, when 20-ml amine slug was added

Fortunately, the condensate-system corrosion problem at Glendale has had a successful solution. The method used is simple and direct, and during the two years it has been in operation there have been no shutdowns caused by corrosion. In fact, there are no indications that any significant corrosion has occurred anywhere in the condensate system. The method used to bring about this control of corrosion may be of interest to others facing the same or similar problems.

Costly Problem. Our 40,000-kw steam-electric plant is of more or less conventional design. For many years, we have made a continuing study of the efficiency of heat transfer in various parts of the plant. And after mechanical cleaning of nonferrous exchangers it was obvious that even a short period of operation, with a relatively small departure from design conditions, proved costly. For example, one badly fouled extraction feedwater heater that raised water temperature to only 200 F instead of 240 F added more than $30 per day to the cost of operation.

Corrosion Factors. Many factors influence rate of corrosion of iron and steel, including temperature, dissolved solids and rate of flow, but the two major causes are dissolved carbon dioxide and oxygen. Dissolved CO_2 forms carbonic acid, lowering the pH and promoting corrosion, since iron dissolves more rapidly in acid solutions. Dissolved oxygen plays a complex part in corrosion, leading to formation of insoluble iron oxides.

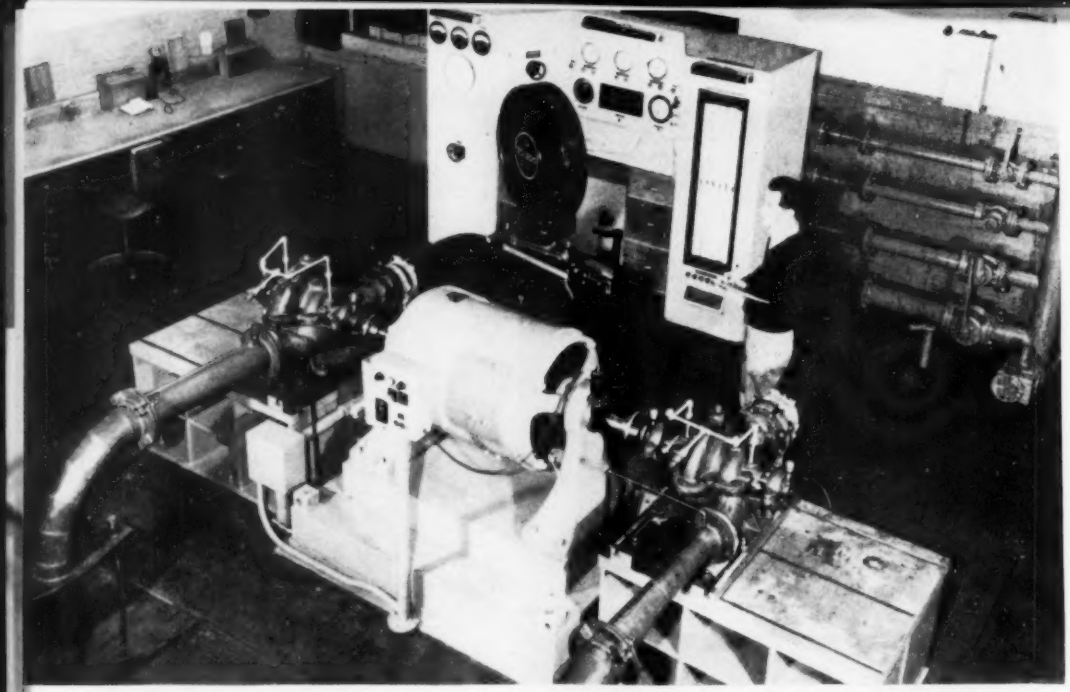
Undoubtedly corrosion factors are somewhat interrelated, although the relationships are not always clear. Generally, however, dissolved oxygen can be satisfactorily controlled by deaeration and by addition directly to the boiler water of an excess of sodium sulfite or catalyzed sodium sulfite. With oxygen, these form sodium sulfate.

CO_2 Control. Control of carbon dioxide has proved a more difficult problem. Deaeration is much less effective with it than with oxygen. But good control can be accomplished by keeping the pH above 7 so no free acids are present. Since boiler water—as distinct from the turbine condensate—generally has a pH of about 10 or 11, by reason of the dissolved alkaline solids, recirculation of boiler water to the condensate system will serve to protect it and the feed pumps. Recirculation was tried at the Glendale plant but proved impractical because with our header system the dissolved solids increased rapidly in the boiler carrying the greatest load.

Some three years ago, therefore, we experimented to see what results could be obtained by the addition of volatile amines to the boiler water. A commercial cyclohexylamine (*Hagamin*, trade name registered by Hagan Corp) was added in batches of 200 ml. The superficial chemistry of the amines is relatively simple. They are highly alkaline and may be considered as hydrocarbon analogs of ammonia. They dissolve readily in water, making it alkaline, and they also volatilize in steam, imparting a similar alkaline quality to the steam condensate in every part of the system.

Dye Tests. First method to test for alkalinity was to take a sample of the steam condensate and add phenolphthalein dye. The dye turned pink when excess amine was present in the condensate. It was immediately apparent, however, that the dye method had a number of disadvantages. Operators would consistently add amine in sufficient excess to be sure the phenolphthalein was "good and red"—just to be on the safe side and often to be sure

(*Continued on page* 188)



TEST STAND has control desk and panel for easy supervision of test conditions. Engineer takes dynamometer reading from large circular scale. Pumps are connected to either end of dynamometer, depending on rotation. Pads help in alignment

Stands Make Centrifugal Pump Tests Faster, Easier

► NEW CENTRIFUGAL-PUMP TEST stations of De Laval Steam Turbine Co, at Trenton, N. J., give complete reproduction of performance for pumps of all sizes, ratings. Designed for production tests, they are also valuable for pump and hydraulic research tests.

Test Stands. These permanent installations have double-ended electric dynamometer mounted on hydraulic lift between two prealigned pump bedplates. Pushbuttons control lift for easy regulation of height alignment. Pumps are coupled to either end of dynamometer depending on rotation direction.

Lateral alignment is automatically set when pump is put on pad at dynamometer end. Electrically operated 1-ton crane simplifies pump handling.

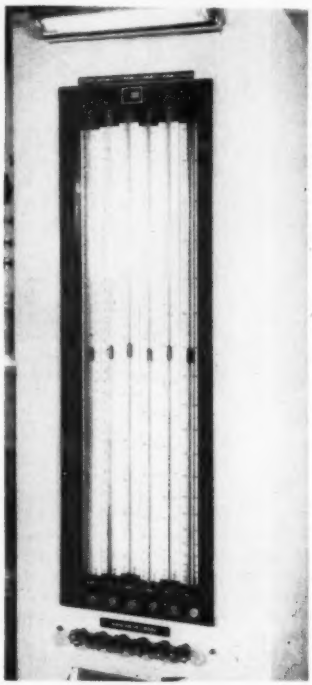
Venturi Banks. Piping system simulates actual field installation. Suction piping includes movable manifold deeply submerged in vortex-free water pool. Interconnected reservoirs' total capacity is 400,000 gal. Water discharges through flexible hose to pipe system below operating level.

Bank of calibrated venturis that run singly or in parallel meter water. Motor-operated valve in discharge line allows additional resistance to be set up so pumps can be tested over wide range of heads. Pipe system doesn't need priming, is free of air locks.

Instrumentation. Test engineer runs system from a control desk and panel. Given flows are set up by button-controlled valve. Flow and pressure readings are transmitted to desk.

Springless scale indicates motor torque to within one-tenth pound. Motor speed is set approximately with synchronous electric tachometer and held accurately by a stroboscopic light.

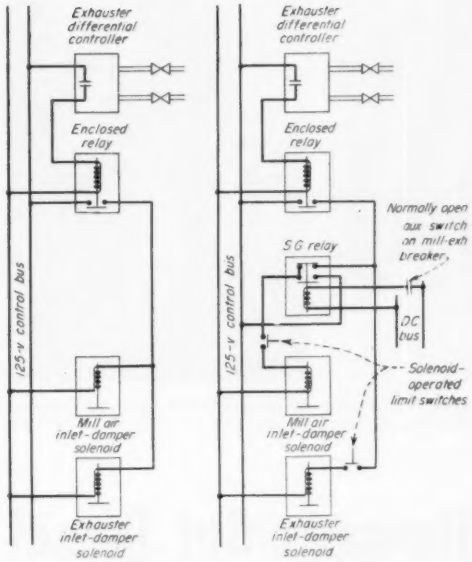
Test Procedure. This follows latest hydraulic codes and simulates field conditions under which pump will run. A minimum of six test points is used.



VENTURI manometers read direct in gpm. Capacities can be read very accurately

Rx Could You Cure This Headache?

By DONALD C SWIFT, *Ebasco Services Incorporated*



Case No. 11—
The Burping Pulverizer

► A NEW POWER PLANT has four tube-and-ball mills for pulverizing coal. They consist of large steel cylinders, lined with tough castings, partly filled with hardened cast-steel balls. The joint between rotating and stationary mill parts has a gap about ¼ to ⅛ in. wide to give necessary clearance.

During the first few months, whenever a pressure built up unexpectedly inside the cylinder, normally under a suction, a nice black cloud of coal dust would puff out through this gap. We had a number of these "dust storms" while trying to get things in shape. The exhauster fan, pulling coal-air mixture out of the mill, runs at constant speed. A control damper at the exhauster-fan inlet regulates air flow through the mill.

A regulator responding to mill suction adjusts the damper in the duct, between hot-air discharge from air preheater and pulverizer inlet, to hold about 1 in. water negative pressure in the mill. The balanced 3-leaf hot-air regulating dampers have horizontal shafts carried in grease-lubricated roller bearings. The 500-F air burned and caked the grease and forced the dusty air into and through the bearings. Result: Dampers were almost impossible to close, and mill air pressure built up causing dust storms.

Different methods cured the sticking damper problem. Using high-temperature grease daily prevented the burning and kept the bearing sealed against dust entry. Other damper bearings were cleaned up and allowed to run dry. They worked well until dust filled them up. By piping clean compressed air to the dry bearings we were able to keep them operating freely.

This helped a lot to cut down the coal-dust leakage. But we still got a puff each time the mill was shut down. System was a little unusual in that pulverizer and exhauster motors were both controlled from one 2300-v circuit breaker. All units were interlocked for safety and in addition a safety device measured the pressure rise across the exhaust fan.

If this pressure dropped to about half the normal 20-in. water head for more than 10 sec, the dampers in the hot-air duct and the exhauster inlet were unlatched (by a momentary electrical impulse sent through an unlatching solenoid) and closed by weights. This isolated the mill from the burners if a serious flareback occurred.

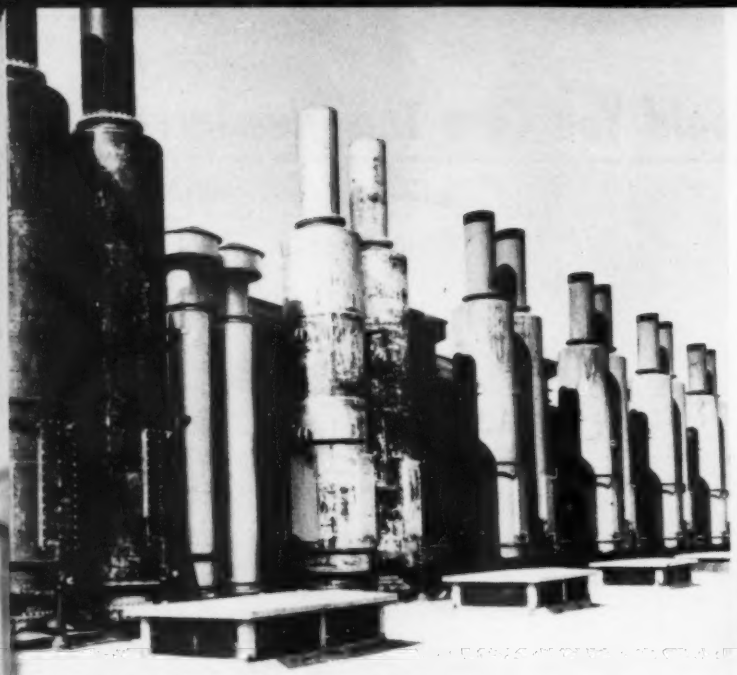
Opening the main mill-exhauster circuit breaker brings the mill to a stop in about 10 sec, but it rocks back and forth a little longer. Meanwhile the exhauster lost speed slowly and the mill inlet-air damper remained open, allowing pressure to build up in the mill and puffing out a cloud of coal dust through the joint. The exhauster fan "coasts" for about a minute after power cutoff. It seemed that if the exhauster inlet damper could be kept open while the mill damper was closed, the positive-pressure build-up could be avoided and the last cause of coal-dust storms be conquered.

After considering several ways, which proved to be too expensive, we rearranged the control circuits on each mill as shown in the diagram. The new SG double-throw relays were not costly. In the normal operating position, if the low-pressure trip on the exhauster operates, current passes through the upper set of relay contacts to operate both damper trip solenoids in a normal manner.

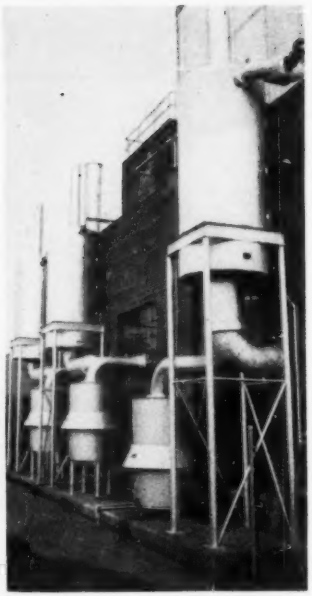
Opening the main exhauster-mill circuit causes an auxiliary contact on the breaker to make a circuit through the SG relay. The relay makes a circuit through the lower set of contacts so that only the mill-inlet-damper-trip solenoid is energized. As soon as the solenoid unlatches the damper it also moves a limit switch, breaking the circuit through the solenoid coil (not intended for continuous duty).

A limit switch was also used on the exhauster-inlet damper solenoid because the mercury switch in the exhauster-differential controller had inadvertently stayed in closed position once or twice and burned out the solenoid coils. When restarting the exhauster the dampers are latched up and the limit switches reset.

We can now keep a clean plant and don't have to periodically excavate coal dust out of the mill motors.



1 **WASTE-HEAT** recovery mufflers in large municipal plant. Each muffler has 150-sq-ft heating coil. Hot water from coil heats fuel before it reaches plant engines.



2 **SILENCERS** heat water that flashes to steam for use in 2-effect evaporator

Heat-Recovery Silencers Cut Diesel

You can capture some of the heat in your diesel's exhaust and still have good silencing if you use waste-heat mufflers or boilers. Here's a short roundup on a few good ways and means

By TYLER HICKS, *Associate Editor*

► OUR FIRST TWO ARTICLES in this series covered diesel-engine noise and some of the silencers available to reduce it, POWER, July, pp 86-87, and August, pp 88-89. In this final article we'll take a quick look at combination units that cut noise and recover heat from engine exhaust.

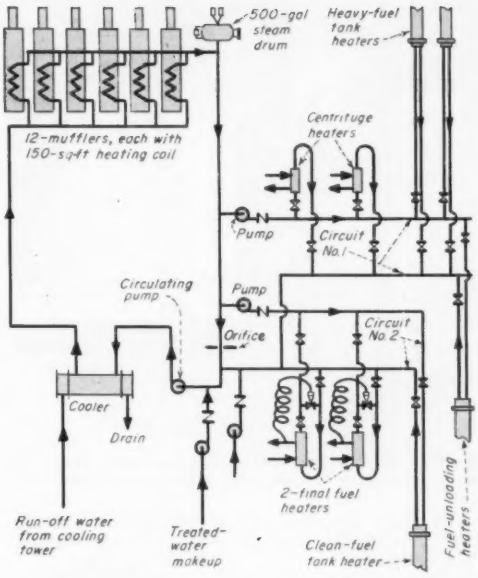
Waste-heat recovery cuts costs in diesel and gas-engine plants. Savings made by using heat that otherwise goes to the atmosphere are sometimes easy to obtain; at other times heat-recovery equipment needed may be extensive. In either case competent engineering analyses show if a scheme will prove out.

Heat Use. Waste heat is good for generating steam, heating water, fuel oil, lubricating oil, air and process fluids. Steam or hot water may be used for building heating, process or other plant services. Air warmed by waste heat is generally used to heat engine room.

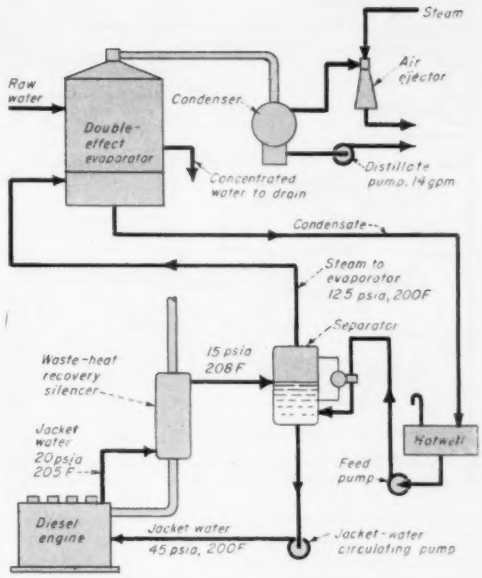
When you stop to think that about two-thirds of the heat in a diesel's fuel doesn't show up as work at crankshaft, you begin to realize some of the savings possible. Every Btu recovered saves the amount of fuel needed to generate this amount of heat in a boiler or other heat-producing device. Of course, savings from waste-heat must be balanced against cost of recovery equipment. This balance is often the deciding factor in the use or non-use of waste heat.

Heat Sources. Either exhaust gas, engine jacket water, or both, will produce plant heat. Fig. 1 and 3 show how exhaust mufflers in a large plant are fitted with heating coils to heat fuel oil at a number of different points between unloading and use. Closed, 400-gpm hot-water system operates at 240 F.

Fig. 2 and 4 show waste-heat recovery silencers in an industrial plant. Jacket water leaving engine at 205 F passes through silencer where its temperature is raised 3 F to 208 F by hot exhaust gas. Part of water flashes to steam in separator, steam going to evaporator and remaining water to jacket circulating pump. This plant produces 22,500 gal of distilled water in 24 hr from heat that would be wasted.



3 **FUEL-HEATING SYSTEM** operates under pressure. Exhaust heat ups temperature of water circulating in heaters to 240 F



4 **ENGINE-JACKET WATER** and exhaust-heat recovery system for an industrial plant. Only 20% of heat in fuel is wasted

Noise, Jack Plant Thermal Efficiency

Diesel engines and air compressors in Fig. 5 team with unit heaters to cut heating fuel costs in winter. Cooling water first flows through compressor jackets, then engine jackets, and last, through watercooled engine exhaust manifold before going to unit heaters. Radiator dissipates heat in summer. This plant recovers about 1250 Btu per hr per cfm of compressor capacity at 100 psi. This heat is picked up during the series flow through aftercoolers, compressor and engine jackets, and watercooled exhaust manifold.

Fig. 6 shows a simple method of air heating that utilizes a propeller fan and louvers. With a little planning you should be able to take this idea and change it to suit your plant building.

Mufflers built to recover heat from exhaust gas resemble units that perform one function only—noise reduction. Fig. 7 shows a silencer for horizontal installation that has extended heating surface forming conduits to lead exhaust gas from one attenuating chamber to another. Heat from gas generates steam in silencer steam space. Unit may be run dry, if necessary. Automatic operation of unit is possible when fitted with suitable controls. Similar designs are made for vertical installation.

Muffler in Fig. 8 warms air before it enters engine room. Blower forces warmed air through heat exchanger. Hot-air bypass and a damper control temperature of air entering room. Fan is shut down in summer.

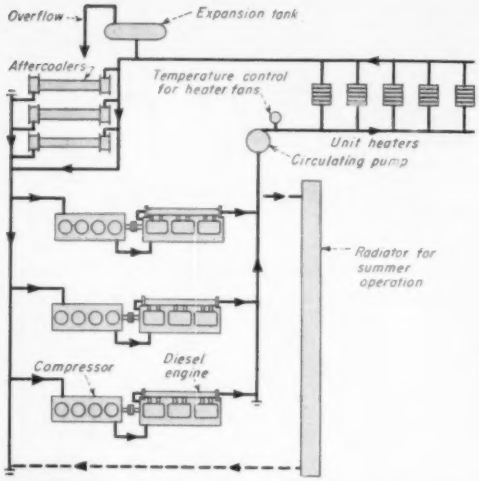
Waste-Heat Boilers. When built for production of moderate or large quantities of steam or hot water, waste-heat boilers resemble fire tube or watertube units of standard design. Quantity of steam generated is often controlled by regulating boiler feed. Unit then runs as a flash boiler. Most waste-heat boilers can run dry without harm when steam or hot water is not needed.

Watertube waste-heat boilers have tube designs that present large heat-transfer surface to the relatively low-temperature exhaust gas. Gilled-ring or spirally coiled tubes may be used. Some plants use existing boilers to generate steam from exhaust gas. This arrangement is suitable where only a moderate amount of steam or hot water is needed. Efficiency is usually low compared to well-designed waste-heat boilers. Be sure to have approval of boiler manufacturer and local inspector before converting an old boiler to this service.

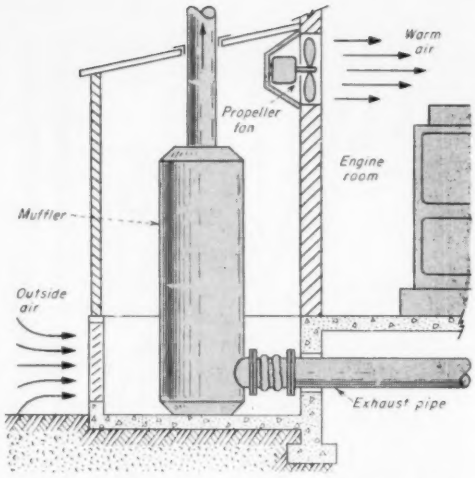
Most waste-heat boilers are excellent mufflers. So it is seldom necessary to have an auxiliary muffler, whether boiler runs wet or dry.

Heat Available. Cooling a pound of water 1 F releases 1 Btu. So if we cool 100 lb of jacket water 10 F we obtain 1000 Btu. This heat can be used any way we desire, whether the water is mixed directly with substance to be heated or passes through a heat exchanger. Of course, temperature difference between jacket water and substance heated must be great enough to permit heat transfer.

Roughly 25 to 30% of heat available in fuel can be recovered from jacket water. Exact amount depends on engine type, its heat balance, heating job



5 **JACKET WATER** flows through aftercoolers, compressor and engine jackets and manifold to pick up Btu for unit heaters



6 **HEAT AIR** for engine room by mounting fan as shown. This hookup is used only when the muffler does not heat water

performed, load and other factors. Determine this by multiplying weight of water circulated by its temperature rise if water is cooled to its initial temperature.

Heat recoverable from exhaust gas varies with engine type and load. Four-cycle-engine exhaust-gas temperatures run up to the 750-F range at full load while 2-cycle engines are in the 550-F range. Good practice in waste-heat system design keeps gas temperature leaving boiler above 300 F. This prevents moisture condensation and the accompanying possibility of corrosion.

Because exhaust-gas temperature varies about in proportion to engine load, heat recovery at half load or less is usually small. At full load about 50% of heat in exhaust gas is recoverable with standard waste-heat units. Oversizing waste-heat boiler or muffler permits more heat to be recovered. By fully recovering jacket-water heat and as much exhaust heat as possible at full load on engine, 80 to 85% of total fuel energy is used.

Engineering. Like straight noise reduction, waste-heat recovery from units that also silence engine requires careful engineering. First, calculations to prove or disprove the economic soundness of the idea are needed. If these show that heat savings can pay equipment cost, you are free to go ahead with studies of space needs, structural problems and other physical details of the installation. You'll get best results in economic studies by having a consulting engineer do the job for you.

Once heat recovery is proven feasible from economic and physical standpoints the muffler or waste-heat boiler manufacturer is called in. He'll specify attainable noise reduction and amount of heat recoverable. Don't overlook the fact that noise reduction is the primary job of a silencer. When you have noise down to the point where other people can live with you the heat-recovery possibilities of a given design can be investigated.

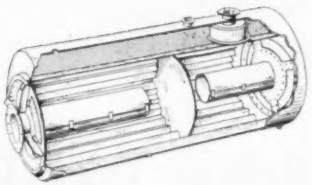
So work closely with a consulting engineer and silencer manufacturer. There is no substitute for long experience and sound engineering when you come to waste-heat recovery.

Check Design. Dont' overlook simple design faults that may lead to operating troubles. A few that pop up every now and then are: (1) unprotected air-heating coils that freeze in winter (2) waste of good steam from high-temperature cooling systems (3) use of only one muffler or boiler for a number of engines (4) excessive oversizing of muffler to increase heat recovery and (5) reduction of exhaust temperature to too low a level.

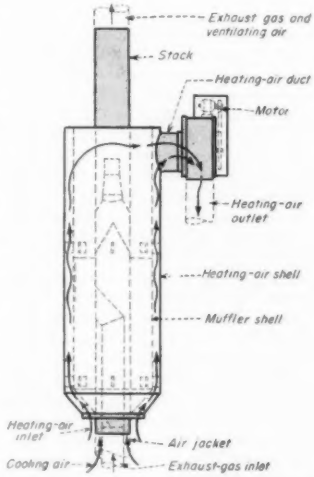
Fortunately, all these faults are easily remedied by careful checks of a proposed system before construction. Homemade or compromise systems that are not competently engineered show these faults far more often then hookups and units that have proven themselves in service.

Operation. Like other power equipment, heat-recovery units of all types

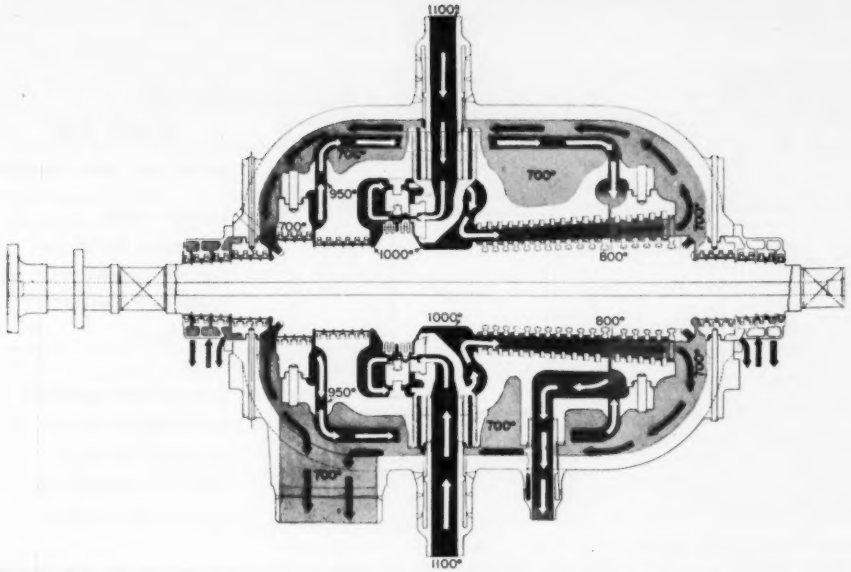
(*Continued on page* 192)



7 **ECCENTRIC** construction gives maximum steam space in this silencer



8 **FAN** draws air through muffler jacket before discharging to the engine room



HIGH-TEMPERATURE STEAM enters near center of h-p cylinder to flow through first-stage blading. After 180-deg turn, steam completes pass through cylinder, exhausts to annular space between the inner and outer shells, goes to l-p cylinder

Cooling With High-Temperature Steam

Ever higher levels of throttle temperature pose new problems for the designer of today's turbines

By H R REESE, *Steam Division, Westinghouse Electric Corp*

► ROUTING PARTLY EXPANDED STEAM over exterior surfaces of inlet-steam parts does some highly desirable cooling in the high-temperature element of a steam turbine. While this doesn't effect any net economies, it reduces the amount of critical materials needed and the wall thickness of the shells.

Arrows in the figure above trace steam flow from inlet to exhaust of the turbine cylinder. The first-stage blading, the governing stage, is reversed end-to-end from the usual arrangement. Steam enters from the separate steam chests at 1100 F through inlet sleeves to go to the nozzle chambers. After expanding through the nozzles it leaves the first stage at about 1000 F. This steam reverses, flowing over the first-stage element and between the nozzle chambers to the inlet of the first blade group. Steam flow over the hotter parts minimizes heat radiation to adjacent members.

Steam expands through the first blade group to the first extraction point. If extracted, the 800-F steam flows from the inner casing through a slip joint to the outer casing into the bleed line. Part of the high-pressure packing leakage at impulse-chamber temperature, 950 F, returns through the leak-off piping to the first extraction zone and flows out with extracted steam. When not extracted the packing steam returns to the blade path.

Steam expanding through the second group of blading drops to 700 F. The inner casing supports the second group of blading and the low-pressure balance ring. The inner casing entirely confines the high-temperature steam.

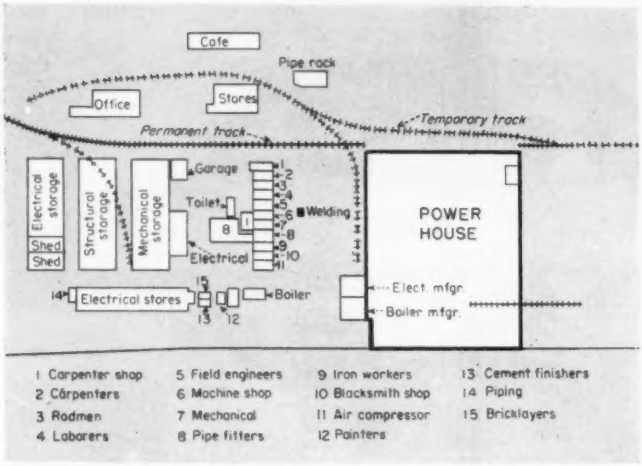
Feature of the design is reverse flow of the relatively cool exhaust steam toward the inlet end between inner and outer casings, exhausting to the reheater through the opening in the base at the opposite end. Large flow areas keep steam velocities low and insure a low pressure drop.

Lower metal temperature permits reducing the casing wall thickness, casing bolt diameters, and requires less highly alloyed materials. The latter is of great importance during present world-wide emergencies.

Thinner and lighter walls make the turbine more suitable for load changes and for starting and stopping operations. Thinner walls heat or cool more rapidly, following load and temperature change in a more satisfactory manner.

Double casings, each of lighter construction with smaller bolts, reduce inspection and maintenance time. Better thermal and mechanical characteristics of the design lengthen the time between inspections.

This method of cooling with steam is being used for a 1100-F turbine needing stainless steel (austenitic steel) for parts in contact with steam at initial temperature. This method can be applied with the same advantages for structures using ferritic material.



CONSTRUCTION STORAGE AREAS planned for large power plant. Temporary railroad trackage supplements permanent installation. Workmen's quarters close to plant

Check List

Before you start, consider:

Storage areas
Temporary buildings
Parking space
Temporary services
Commissary
Labor
Construction equipment
Construction staff
Personnel manager
Laws and regulations
Construction manual

Preliminary Steps That Speed Your

Selecting storage areas, rigging up temporary power services, buying and renting the construction equipment are but part of the groundwork you should tackle before the job gets under way

► SMOOTH SAILING in the later stages of plant construction hinges largely on the thinking that went in at the preconstruction stage. The first and fundamental step is careful inspection of the site. The superintendent along with his key construction men makes this tour. Their aim is to study general topography, railroad connections, distance to river, etc. One tangible result of this survey is location of storage areas.

Storage area must be located so railroads and roads can reach it readily. It must not seriously interfere with construction work to come later.

Check construction-progress chart in laying out the storage and materials-handling area. Where possible, plan to move heavy equipment from railroad cars or trucks right into place in power plant. In laying out railroad trackage to reach storage areas, plan so some part is permanent for later plant operation. Remove the remainder when you finish construction.

Consider excavating and grading needs in planning storage area. Where space is restricted this is a serious problem. If not planned, equipment and material may be placed where fill is needed later. This means moving stored material twice.

Temporary Buildings. After mapping out the storage area consider the size, number and location of temporary buildings. You'll need many such buildings, as temporary general offices for storage of material and equipment that cannot be exposed to weather, and as shops for the different trades and subcontractors.

It's general practice to have a building for each trade, such as masons, pipe fitters, millwrights, electricians. And there's one for each of the main subcontractors. These buildings may have to be supplied with water, compressed air, electric service and heat. Quonset huts have been used. But the curved shape limits amount of space along sides. Erect all construction buildings as cheaply as possible. Yet make them weathertight and substantial enough for two years' use.

Place these buildings as close to plant as practical to cut down traveling time. Office building will house the superintendent, his assistants, the general foremen, purchasing and accounting departments, field engineers and draftsmen. Locate the first-aid room here.

Parking Space. Today most power plants are in or near villages. Any sizable town is generally some distance. And since passenger-railroad and bus service is generally not to be had, workmen come in autos. Provide parking space close to the job to cut down lost time. Use a cinder fill so it will stand up during rainy seasons.

Temporary services, like electricity, steam, water, compressed air, heating, are costly and hence call for careful planning. These services plus construction equipment may range from 8 to

Construction Staff

Key men and their responsibilities on any power-plant job:

General superintendent. In complete charge. Usually he has one or two assistants

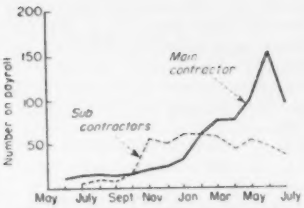
General foremen. Head up operations like excavation, brickwork, structural steel, piping, electrical work

Purchasing agent. Handles the many items bought during construction. Expediting comes in this department too

Accountant. Responsible for all time records and payroll

Resident engineer. In charge of field engineers and designers

Draftsmen. Prepare on-the-job sketches to supplement drawings



LABOR FORCE comes slowly to peak during early stages, then drops off quickly

Power-Plant Construction

By R A LANGWORTHY
Sanderson & Porter, Engineers and Constructors

12% of the cost on larger jobs. Carry temporary power services overhead or underground as conditions dictate.

Motor-driven compressors can supply compressed air from several points. This is generally better than a central compressor station with its long piping runs.

When planning electrical service consider the many welding machines used. Run lines to the welding load areas, keeping in mind the heavy welding needs of modern boilers, condenser shells and piping systems. Besides temporary indoor lighting, provide for possible flood-lighting during excavating and concreting. This pays off for short winter days and night work. Plan for yard lighting of roads and storage areas.

Pipe drinking water throughout the plant. Once again consider the time-saving angle to reduce lost man-hours. Water for concreting may be taken from a nearby river as a cost-saving measure. If so, have it analyzed.

Steam supply is needed for heating construction buildings and certain parts of the job itself. In addition, isolated locations may be heated with salamanders. Where needs call for a temporary central-heating boiler, figure on about 125- to 150-psi pressure to cut down size of pipelines. Spot reducing stations where heating lines are taken off. A rented package boiler is well suited for this job.

Sanitary facilities for the construction crews mean installing a septic tank and tile field.

Commissary. Almost all construction jobs are far from eating places. It's generally best to have experienced people run the commissary on a concession basis. If the construction group tries to run its own commissary, it's asking for a first-class headache. Usually the only meal needed is lunch. On larger jobs the men can be fed in two or three shifts.

Labor. Look into the labor market in the area, especially for skilled workers, like bricklayers, boilermakers, carpenters, steel workers, pipefitters, electricians. Because some of this labor may have to be brought from a distance, traveling time and housing must be considered.

Common labor is usually picked up fairly close to the job. Construction superintendent should have one or more men whose sole job is to scout out labor. The estimated labor schedule will show the number of men of different classes and trades that will probably be needed during the various construction stages. It is a good guide for the employment man.

One job for labor scouts is to study housing. This will help in signing up men. Remember, the labor force rises gradually to a peak at about one-half to three-quarters of the job life, and then drops sharply.

Superintendent should handle any problems involving unions, jurisdiction, etc.

Construction Equipment. Purchasing department with aid from superintendent and general foremen will determine what materials can be had nearby. This involves materials like sand, crushed stone, cement, brick, ready-mixed concrete, valves and fittings, mill supplies, tools.

Investment in construction equipment can be sizable. Needs run from small pumps to heavy construction cranes. The storage yard requires several traveling cranes. A locomotive-type crane is needed to move heavy equipment on and off railroad cars. Provide for a diesel switching engine as the railroad will not run their heavy equipment over construction tracks. And on down the line, through air compressors, welding machines and machine shop equipment, selection of construction equipment is a major problem.

After determining the equipment needed, the next question is whether to buy or rent. Answer generally is to buy some items and rent others. Renting is often best for heavy equipment used but

a short time. When renting, have equipment carefully inspected at the supplier's yard before it's shipped. The inspector's report shows its true condition. One copy of this report goes to superintendent and another to supplier.

New equipment is usually sold when work is finished. Difference between first cost and selling price is charged to the job.

Construction Staff. One of the first jobs for the general superintendent or project manager is to organize his construction staff and hire men. Superintendent usually brings many key men who follow him from job to job. This yields a nucleus of trained men who have worked together.

In general, a construction staff is organized along following lines:

1. General superintendent has complete charge and is entirely responsible for all operations. He usually has one or two direct assistants who have no specific job but who are assigned to duties that he feels are essential.

2. General foremen are mighty important. These "sergeants" of the construction force are usually old-timers with plenty of experience. They know building practice and can handle labor. There are separate general foremen for excavation, brickwork, structural steel, piping, electrical work and millwrighting. Under them are subforemen.

3. Purchasing agent with assistants and clerical help must be on the job. Usually the client or consulting engineers purchase the major items of equipment. Either may negotiate and place the business, and then send information to the field office, letting them write the formal order.

Larger-equipment purchases are usually covered by contracts. A formal purchase order should always confirm such contracts. This insures that all orders are issued from a single source, keeping the records straight. During life of the construction job thousands of items must be purchased locally. Handling them calls for a fairly good-size, competent staff.

A good purchasing agent is valuable on any job. It is not only a question of getting a low price on material and equipment, but also of knowing where to get them and getting proper deliveries. Expediting is usually placed under the purchasing agent. Sometimes the home office handles it. But expediting may be done entirely by the field office and often more efficiently.

Purchasing agent must set up a system of forms for keeping records like purchasing orders, requisitions, stock inventories. Most large power plants today are built for big utilities, which are under jurisdiction of a public utility commission. They may also come under the Federal Power Commission. These Commissions have their standard accounting methods. Purchase orders, requisitions, etc, should be made up with this thought in mind. For the smaller job it's simply a matter of scaling down, keeping the same basic structure.

4. Accounting department keeps all accounts in the field office. After consultation with the client, a standard system is set up that meets needs of client, and of any standard accounting systems of Commissions having jurisdiction. Accounting department also handles all time records and payments to workmen. Timekeeping on a large job is a major problem.

5. Engineering force needed depends on conditions. It is best to have a resident engineer in charge and men under him to lay out lines, set grades, etc. Often much of the detail engineering design is done in the field, requiring engineers and designers.

In any case, a few such men are needed because many sketches must be made promptly to supplement main drawings. Engineers are also responsible for checking quality of workmanship, and materials and equipment received. They have to supply information for monthly progress reports and keep the construction progress charts up to date.

In addition to the above, other functions must be provided for, such as first aid, telephone and telegraph service, messenger service.

Personnel manager processes all men who are employed and discharged, and sees that records are kept. Labor turnover is often large. Compensation insurance and social security laws require records. One man should have this responsibility. On a large job a separate division, headed by a man who understands these records, handles them.

Laws and Regulations. The general superintendent has one of his immediate assistants see that all local, state and Federal laws and ordinances are lived up to, necessary permits obtained, etc. When plants are on rivers classed as navigable streams, state and Federal government regulations, including pollution control, must be considered.

Construction Manual. Final preliminary step is preparing a *Manual of Construction Procedure*. This Manual is prepared by the construction organization, working with the consulting engineers and client. After approval of all concerned, it becomes the bible for job operation. It summarizes the steps outlined above and includes details as to how each step is to be handled.

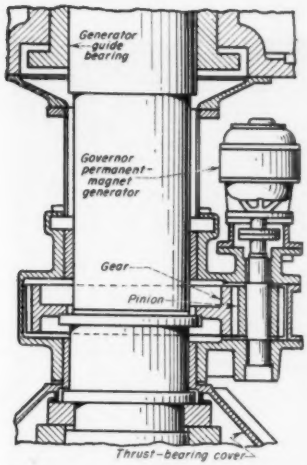
The Electrical Side of Plant Construction

The above article, covering preliminaries in power-plant construction, is the first in a planned series. In this and future issues, the aim is to bring to the power engineer a picture of today's practice in plant electrical construction. Each article will be flavored with on-the-job problems met in everyday erection and installation.

As an example, let's look at next month's offering. Here, W V King, of Gibbs and Hill Inc, will cover the mechanics of setting up a construction schedule. And at a later date, the fundamentals of structures as applied to power plants will be aired. In this latter article, the author will discuss the feasibility of placing conduit in concrete, how to provide for channels, anchor-bolt selection, etc.

Further along in this series there will be a roundup of wiring methods used within the plant. In short, a comparison of conduit, bus duct, cable trays, etc. Information will be given here to help in selecting conductors, insulations and sheaths.

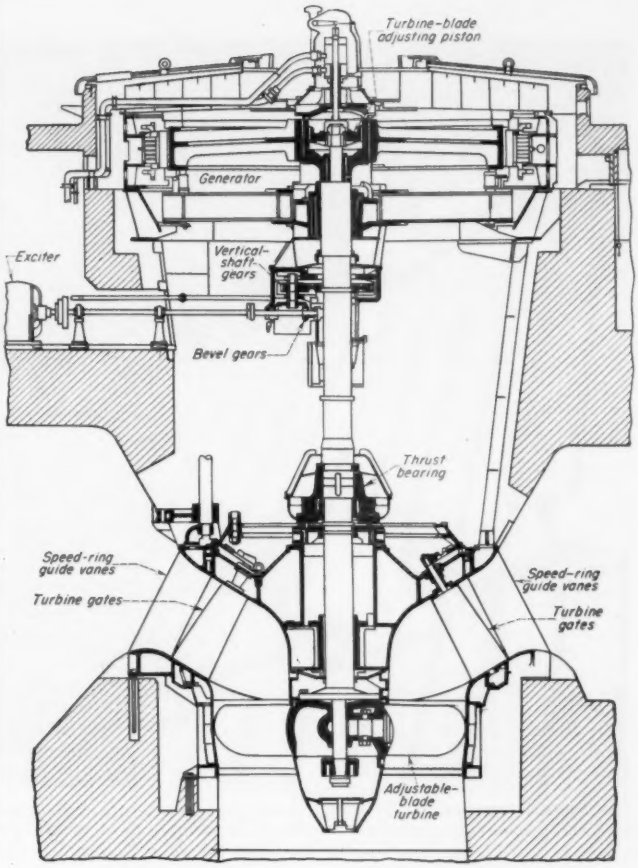
And so on through each of the major phases of electrical construction, winding up with an analysis of the methods of testing your new equipment.



1 Governor-flyball-motor generator is gear-driven from main generator shaft

Design Reduces Costs of Remodeled Plants

To lower the needed headroom and costs, exciter and governor - flyball - motor generator were geared to main generator shaft in revamping plants



2 Horizontal-shaft high-speed exciter geared to vertical-shaft 5000-kva 6300-v generator. Double-speed reduction is obtained through the spur and bevel gears

By H W HAMM
Design Engineer, S Morgan Smith Co

► OLD HYDROELECTRIC POWER developments often present the problem of replacing their worn-out units with modern ones for higher power and efficiency. To keep the cost as low as possible the old powerhouse should be used. Such buildings often lack the necessary headroom, particularly when horizontal-shaft units are to be replaced by vertical ones.

For simplicity in design and operation, the exciter and permanent-magnet generator for the governor-flyball motor are generally above the generator and coupled to its shaft. This arrangement has its disadvantages, as follows:

1. Total height of the main units is increased, as is the headroom required to assemble and dismantle the equipment. This means an increase in powerhouse height.

2. On low-head low-speed turbines the exciter operates at the low speed of the turbine. In interconnected systems, high speed is desirable to obtain sufficient speed and range of regulation. Speed of medium- and high-head turbines is satisfactory for this purpose.

3. Cost and small size of a high-speed horizontal-shaft exciter are in its favor. This also applies to the governor permanent-magnet generator.

4. Rotor of a direct-connected exciter has more radial play than is desirable for best operation, because of the comparatively large clearance in the generator and turbine guide bearings.

For these reasons, especially because of the saving in headroom, separate mechanically driven exciter and governor permanent - magnet generators have advantage when replacing old units. This is particularly true when headroom is close and the cost of powerhouse alterations can be saved.

Fig. 1 and 2 show two arrangements that have been used in Europe. In Fig. 1 the permanent-magnet generator for the governor-flyball motor is mounted vertically below the main generator's guide bearing. It is gear driven at about four times main-generator speed. The speed greatly reduces the size of the permanent-magnet generator and simplifies its installation. This application is on a 4000-kva 1900-v 50-cycle generator driven by a kaplan turbine.

(*Continued on page* 188)

CONTINUOUS watercooled loop of ¾-in. extra-heavy seamless-steel pipe wrapped around the soot-blower element gives lasting support to soot-blower members whose old-style hangers failed entirely every six weeks under temperature, chemicals

Upkeep Licks Soot Blower Failures

By **GEORGE J van BEEK**, *Howard Smith Paper Mills, Ltd*

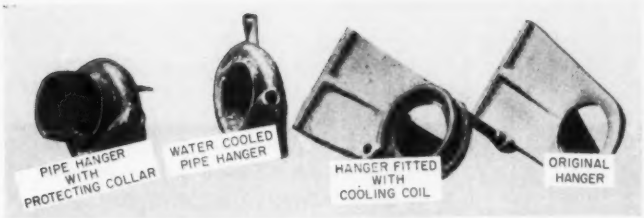
► MAINTENANCE in a working boiler covers a wide range of activities. Upkeep of some of the equipment presents tougher problems than others. And one of the toughest jobs is keeping nonretractable air-puff soot blowers operating in a soda-pulp-recovery furnace, particularly under high-temperature conditions, say, about 1500 F. Yet the Cornwall Division of Howard Smith Paper Mills, Ltd, Canada, worked up a way of licking this problem completely.

Right after their first failure, the boiler-screen soot blowers were pulled out and carefully gone over for telltale clues. The soot-blower elements were junk and the backs of the hanger completely burned away. Inner ends of the blower near the center, or hottest part of the furnace, suffered pits that went in to a depth of about ⅛ in. The age-old question of which came first cropped up. How could we tell if the blower itself failed first, causing a slag screen plug-up, and then the resulting heat produced the burning off of the hanger. Or had the hangers failed first?

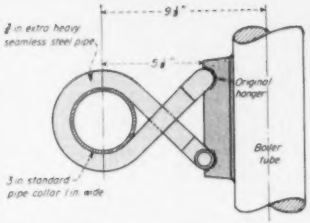
Air-Cooled Elements. We replaced the damaged elements and hangers. Next we inserted a ¼-in. black iron pipe through the blower head and extended it inside the element to within six inches of the end. Bottom photo, facing page, shows the pipe passing through head with its air connection. Into this cooling-air connection we fed a trickle of air from the 250-psig soot-blower supply main. In this way we got cooling air into the hottest part of the element first and let it escape through the blower jets.

The soot-blower element turned freely on the internal cooling pipe with no indication of any binding. The air kept the element jets clear of soda ash and reduced the severity of chemical attacks on the blower ends. From all counts the cooling air seemed a good move. It increased the life of the elements to where all failures came from hangers burning out first. Our problem was, "How can we save the hangers?"

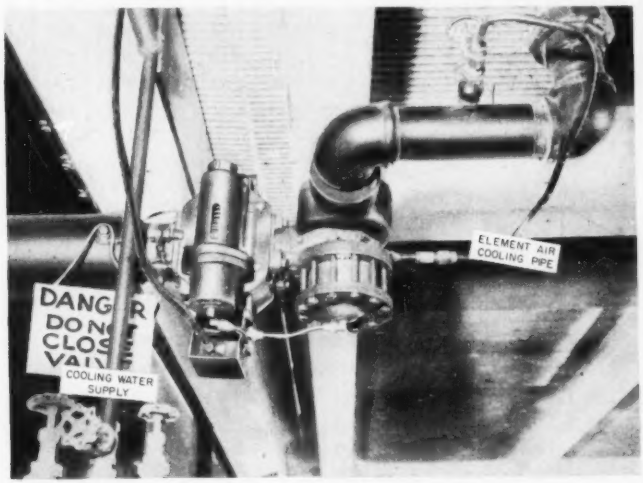
One quick answer seemed to be establishing a lower-temperature atmosphere for the hangers to work in. Center line of our blower element stood 9⅛ in. from the center line of the tubes. If we moved the blower closer to the



WATERCOOLED HANGER assembly, *facing page*, grew out of progressive studies starting with plain hanger, *far right in this photo*, and, *working left*, to coil support



COOLING-PIPE loop details, plus welded bearing ring around element, show here



AIR COOLING with a ¼-in. black iron pipe run through the soot-blower head, *above*, was first try at lengthening hanger life, gave some hope, pointed way to solution

Here's how a large pulp mill worked out special soot-blower hangers and supports that cured recurring failures in high-temperature, slag-screen zone of soda-ash recovery boilers

tubes, they'd be spotted in a better atmosphere. It stands to reason that the closer we got to the water-bearing tubes the lower would be the temperature of the blower element's surroundings.

Moving the blower element raised special problems all its own. First off, we'd have to rearrange waterwall tubes and relocate soot-blower wall boxes. Then we'd have changed the blowing arc of the soot-blower elements, and at 9⅛ in. they were doing an excellent job. We decided it was better to experiment with watercooling the soot-blower hangers.

Watercooled Bearings. For our first attempt we looped ¼-in. standard black iron pipe around the original hanger or bearing and welded the two together, photo, top of page. We interconnected the different soot-blower element hangers, and formed a continuous coil through which we ran a flow of water.

This improvised coil lasted about two months before the combined attacks of heat and chemicals caused failure at the threaded union joints. But out of the experience this first watercooled hanger gave us we drew enough data to design a satisfactory one.

The latest design replaces the original hanger with a loop support made from ¾-in. extra-heavy seamless-steel pipe. Short nipples and 90-deg welding elbows permit interconnection between individual loops. Sketch, top of page, shows one of these watercooled support hangers in position. Inside the loop a 1-in.-wide collar cut from standard 3-in. pipe has been welded to form bearing ring for element. As a further protection for the end of the blower farthest into the furnace we cut the hanger collars to form a shield.

Installation. Fortunately the soot blowers had been installed in the furnace from each side on a common center line. As a result we could hook up the watercooled hangers in a continuous coil arrangement across the 14-ft furnace. Cooling water flows in one side and leaves on the opposite side with no return piping needed.

We made up the assembly in two sections so we had only the one weld within the furnace to bring the two pieces together. Photo on facing page, shows the complete coil in place with elements back in working position. We welded the pipe hanger assembly to the studs of the original hangers. These we trimmed as needed.

Operating Results. Since these watercooled hangers went in (about a year at last reading), no pitting, burnings or failures have shown up. Maintenance is nil, as contrasted to the previous operating record of a 6-week life for elements and hangers in the slag screen region.

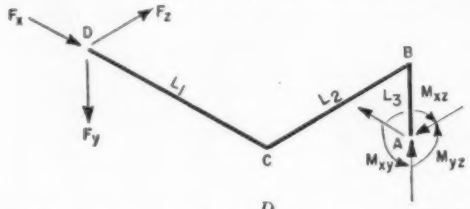
We pass about five gallons (imperial) through the coils per minute and get a temperature rise of about 80 F. Exact rise depends on the steaming load but at no time has the water exit temperature gone above 150 F. Bear in mind that we expose about 35 ft of ¾-in. extra-heavy seamless pipe to the flame at an average temperature of 1300 F.

Whatever movement takes place, among the boiler tubes that carry the coils, has caused no element jamming at any time. What's more, the coils have proved strong enough to withstand the blows they receive from masses of fused soda ash weighing as high as 100 lb and falling as much as 25 ft.

All in all, our redesign of trouble-making soot-blowers has paid off handsomely in longer operating life.

Three-Dimensional 90-Degree Turns for Power and Industrial Applications

$m = 1$									$m = 2$								
n	k_b	k_t	k_x	k_y	k_z	k_{xy}	k_{zz}	k_{yz}	k_b	k_t	k_z	k_y	k_z	k_{xy}	k_{zz}	k_{yz}	n
0.25	A&D 30.24	A&D 0.95	8.56	8.56	3.2	4.9	0.31	1.37	A 41.40	A 2.09	10.0	2.75	1.41	6.9	0.60	0.74	0.25
0.50	A&D 22.40	A&D 1.36	5.25	5.25	4.0	3.7	0.45	1.82	A 30.54	A 3.03	6.92	1.82	1.95	5.0	1.01	1.07	0.50
0.75	A&D 19.62	A&D 1.66	3.78	3.78	4.4	2.5	0.55	2.13	A 22.14	A 3.33	4.78	1.29	2.00	3.5	1.10	1.11	0.75
1	A&D 19.20	A&D 1.68	2.80	2.80	4.8	2.0	0.55	2.53	A 18.12	A 3.36	3.70	0.98	2.00	2.8	1.12	1.14	1
2	A&D 26.7	A&D 1.11	1.20	1.40	6.4	0.9	0.37	4.10	D 13.50	D 0.42	1.27	0.45	2.06	1.0	0.66	1.30	2
3	A&D 34.5	A&D 1.65	0.94	0.94	7.9	0.8	0.58	5.66	D 17.34	D 0.45	0.85	0.29	2.38	0.70	0.66	1.66	3
4	A&D 43.4	A&D 1.98	0.74	0.74	9.5	0.64	0.65	7.2	D 21.0	D 0.39	0.65	0.21	2.72	0.56	0.68	2.01	4
5	A&D 52.2	A&D 2.17	0.62	0.62	11.0	0.55	0.72	8.6	D 25.3	D 0.42	0.52	0.17	3.10	0.45	0.63	2.38	5
6	A&D 61.0	A&D 2.31	0.53	0.53	12.6	0.48	0.77	10.2	D 29.4	D 0.51	0.44	0.14	3.43	0.39	0.68	2.76	6
7	A&D 70.0	A&D 2.43	0.47	0.47	14.1	0.43	0.81	11.6	D 33.5	D 0.51	0.39	0.12	3.79	0.35	0.72	3.13	7
8	A&D 79.2	A&D 2.70	0.42	0.42	15.7	0.39	0.91	13.2	D 37.6	D 0.63	0.35	0.11	4.16	0.32	0.75	3.50	8
9	A&D 88.2	A&D 2.76	0.38	0.38	17.2	0.35	0.93	14.6	D 41.4	D 0.53	0.31	0.093	4.50	0.28	0.76	3.84	9
10	A&D 97.0	A&D 2.81	0.35	0.35	18.8	0.33	0.95	16.1	D 45.5	D 0.60	0.29	0.085	4.84	0.27	0.80	4.20	10



Bending Stress $s_B = k_b \cdot c \cdot \dfrac{D}{L_3}$ psi

Torsional Stress $s_T = k_t \cdot c \cdot \dfrac{D}{L_3}$ psi

Reacting Force $F_x = k_x \cdot c \cdot \dfrac{I_P}{L_3^2}$ lb

$L_1 \geqq L_3$

$\dfrac{L_1}{L_3} = m$

$\dfrac{L_2}{L_3} = n$

Reacting Force $F_y = k_y \cdot c \cdot \dfrac{I_P}{L_3^2}$ lb

Reacting Force $F_z = k_z \cdot c \cdot \dfrac{I_P}{L_3^2}$ lb

Reacting Moment $M_{xy} = k_{xy} \cdot c \cdot \dfrac{I_P}{L_3}$ ft. lb.

Reacting Moment $M_{zz} = k_{zz} \cdot c \cdot \dfrac{I_P}{L_3}$ ft. lb.

Reacting Moment $M_{yz} = k_{yz} \cdot c \cdot \dfrac{I_P}{L_3}$ ft. lb.

I_P in inches^4 L in feet D in inches

Easy Tables Crack Tough Pipe Problem

Here are four more tables to speed your piping calculations. These take the grunt out of three-dimensional 90-degree turn figuring. Use them on your next power or industrial design

By S W SPIELVOGEL, *Assistant Division Engineer, Consolidated Edison Co of New York*

► PREVIOUS ARTICLES covered expansion bends of various types, 90-degree turns and Z-shapes. (See POWER, pp 96-99, Nov '51, and p 103, June '52.) This article—last in the series of tables abridged and reprinted with permission of Grinnell Company, Inc. from *Piping Design and Engineering*—covers 3-dimensional 90-degree turns for power and industrial applications.

Example: Find anchor forces, bending and torsional stress in a 12-in. schedule-80 carbon-steel pipe operating at 750 F when $L_1 = 40$ ft, $L_2 = 30$ ft, and $L_3 = 10$ ft.

Solution: $L_1/L_3 = m = 40/10 = 4$; $L_2/L_3 = n = 30/10 = 3$. From table, $k_x = 0.76$, $k_y = 0.09$, $k_z = 0.65$. Expansion factor c from table = 874. From a table of pipe properties I_p = moment of inertia of pipe cross section = 475 in.^{4}. Then $F_x = (0.76)\ (874)\ (475)/(10)^2 = 3155$ lb. $F_y = (0.09)\ (874)\ (475)/(10)^2 = 374$ lb. $F_z = (0.65)\ (874)\ (475)/(10)^2 = 2700$ lb.

To find bending and torsional stress we must know the values of k_b and k_t. From the table $k_b = 7.26$, $k_t = 0.10$. Bending stress $s_B = (7.26)\ (874)\ (12.75)/(10) = 8093$ psi. Torsional stress $s_T = (0.1)\ (874)\ (12.75/(10) = 112$ psi.

Symbols. All dimensions are in feet except outside diameter of pipe D, which is in inches. Anchor forces F_x and F_y are in lb, bending and torsional stresses s_B and s_T are in psi.

$m = 3$									$m = 4$								
n	k_b	k_t	k_x	k_y	k_z	k_{xy}	k_{xz}	k_{yz}	k_b	k_t	k_x	k_y	k_z	k_{xy}	k_{xz}	k_{yz}	n
0.25	56.7[A]	3.3[A]	12.8	1.78	1.04	9.5	1.10	0.59	72.3[A]	5.0[A]	15.6	1.37	0.84	12.0	1.7	0.49	0.25
0.50	40.3[A]	4.9[A]	8.7	1.12	1.40	6.7	1.64	0.84	50.5[A]	6.8[A]	10.5	0.85	1.13	8.4	2.3	0.70	0.50
0.75	28.7[A]	5.0[A]	6.1	0.77	1.54	4.7	1.68	0.96	32.6[A]	6.7[A]	6.65	0.52	1.12	5.4	2.2	0.72	0.75
1	22.3[A]	4.86[A]	4.5	0.54	1.50	3.6	1.62	0.74	24.0[A]	6.0[A]	4.80	0.37	1.10	3.9	2.0	0.61	1
2	9.3[D]	0.15[D]	1.4	0.22	1.10	1.1	1.00	0.71	8.0[A]	3.6[A]	1.48	0.13	0.80	1.3	1.2	0.51	2
3	10.4[D]	0.24[D]	0.76	0.13	1.08	0.60	0.74	0.70	7.26[D]	0.10[D]	0.76	0.09	0.65	0.6	0.88	0.42	3
4	12.0[D]	0.11[D]	0.52	0.095	1.14	0.44	0.69	0.82	7.98[D]	0.09[D]	0.47	0.055	0.64	0.4	0.66	0.45	4
5	13.7[D]	0.21[D]	0.40	0.072	1.24	0.34	0.58	0.95	8.58[D]	0.16[D]	0.35	0.041	0.67	0.3	0.58	0.50	5
6	15.6[D]	0.22[D]	0.33	0.057	1.33	0.30	0.57	1.06	9.78[D]	0.12[D]	0.27	0.032	0.70	0.24	0.51	0.54	6
7	17.5[D]	0.20[D]	0.28	0.048	1.45	0.25	0.55	1.18	11.04[D]	0.10[D]	0.23	0.026	0.74	0.20	0.50	0.59	7
8	19.5[D]	0.21[D]	0.25	0.044	1.57	0.22	0.56	1.29	12.12[D]	0.15[D]	0.20	0.023	0.80	0.18	0.48	0.65	8
9	21.6[D]	0.21[D]	0.23	0.036	1.68	0.21	0.59	1.42	13.2[D]	0.10[D]	0.18	0.019	0.83	0.17	0.49	0.69	9
10	23.6[D]	0.21[D]	0.21	0.032	1.80	0.19	0.61	1.55	14.3[D]	0.10[D]	0.16	0.017	0.88	0.15	0.49	0.75	10

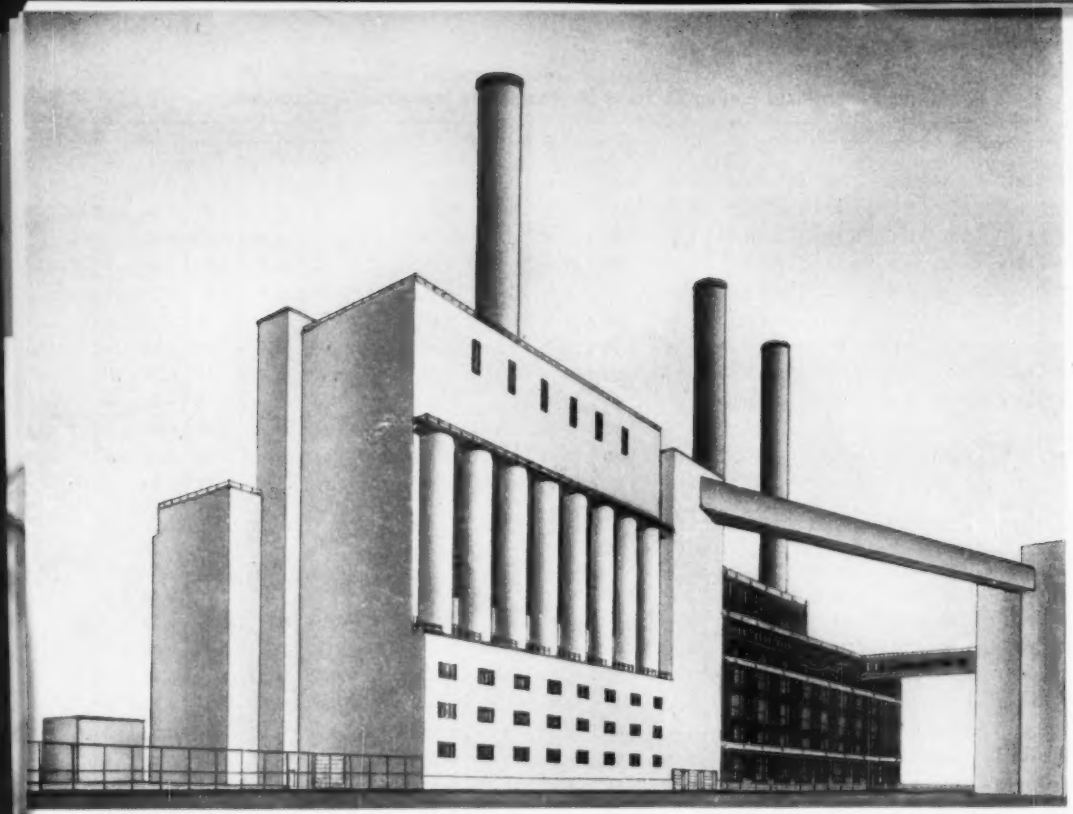
$m = 5$									$m = 6$								
n	k_b	k_t	k_x	k_y	k_z	k_{xy}	k_{xz}	k_{yz}	k_b	k_t	k_x	k_y	k_z	k_{xy}	k_{xz}	k_{yz}	n
0.25	88.2[A]	6.66[A]	18.4	1.13	0.71	14.7	2.2	0.42	102.3[A]	8.19[A]	20.8	0.96	0.62	17.0	2.7	0.38	0.25
0.50	59.7[A]	8.82[A]	12.15	0.67	0.95	9.9	2.9	0.61	69.0[A]	10.77[A]	13.7	0.58	0.82	11.4	3.6	0.53	0.50
0.75	39.3[A]	8.46[A]	7.8	0.42	0.92	6.5	2.8	0.60	44.7[A]	10.30[A]	8.75	0.35	0.79	7.4	3.4	0.52	0.75
1	28.14[A]	8.19[A]	5.3	0.28	0.90	4.7	2.7	0.56	31.5[A]	9.4[A]	6.10	0.23	0.67	5.2	3.1	0.47	1
2	8.61[A]	4.35[A]	1.6	0.09	0.57	1.4	1.5	0.40	9.0[A]	4.9[A]	1.70	0.07	0.47	1.5	1.6	0.33	2
3	6.21[D]	0.066[D]	0.77	0.06	0.47	0.7	1.0	0.31	5.34[D]	0[D]	0.80	0.04	0.36	0.70	1.1	0.25	3
4	6.24[D]	0.057[D]	0.47	0.037	0.43	0.4	0.76	0.30	5.50[D]	0.03[D]	0.46	0.026	0.32	0.41	0.80	0.23	4
5	6.69[D]	0.057[D]	0.33	0.026	0.42	0.29	0.63	0.31	6.06[D]	0.03[D]	0.32	0.019	0.30	0.29	0.67	0.22	5
6	7.11[D]	0.057[D]	0.25	0.021	0.43	0.22	0.54	0.33	6.24[D]	0.015[D]	0.24	0.015	0.30	0.21	0.57	0.214	6
7	7.98[D]	0.069[D]	0.21	0.017	0.45	0.19	0.50	0.35	6.50[D]	0.04[D]	0.18	0.011	0.27	0.16	0.50	0.207	7
8	8.60[D]	0.075[D]	0.17	0.015	0.47	0.15	0.45	0.37	6.80[D]	0.04[D]	0.16	0.0105	0.31	0.14	0.47	0.24	8
9	9.50[D]	0.050[D]	0.15	0.012	0.48	0.14	0.45	0.41	7.02[D]	0.027[D]	0.14	0.0086	0.32	0.12	0.44	0.26	9
10	10.08[D]	0.070[D]	0.14	0.010	0.52	0.13	0.45	0.44	7.33[D]	0.048[D]	0.12	0.0073	0.33	0.11	0.42	0.27	10

NOTE: Letters indicate location of maximum combined stress.

EXPANSION FACTOR, c

Temp., T °F	Carbon Steel	Carbon Moly Steel	½% Cr. ½% Mo. Steel	1–1¼% Cr. ½% Mo. Steel	2¼% Cr. 1% Mo. Steel	4–6% Cr. 1% Mo. Steel	18% Cr. 8% Ni. Steel	25% Cr. 12% Ni. Steel	25% Cr. 20% Ni. Steel	2S Aluminum
400	434	434	435	435	434	408	605	558	534	321
450	503	503	507	507	503	473	694	645	610	
500	570	570	578	578	570	536	785	731	685	
550	637	637	649	649	639	601	872	812	757	
600	701	703	721	721	707	664	957	894	827	
650	763	769	790	790	773	725	1035	969	890	
700	821	835	860	860	836	786	1110	1041	953	
750	874	897	925	925	900	845	1178	1102	1007	
775	895	927	958	958	932	872	1202	1130	1030	
800		956	990	990	962	899	1228	1151	1049	
825		986	1022	1022	991	924	1249	1170	1066	
850		1015	1053	1053	1020	949	1261	1183	1075	
875		1041	1083	1083	1045	972	1268	1190	1080	
900			1112	1112	1071	995	1266	1190	1080	
925			1139	1139	1094	1016	1262	1190	1078	
950			1160	1160	1117	1032	1258	1181	1071	
975			1181	1181	1132	1048	1248	1178	1063	
1000				1202	1151	1062	1232	1165	1052	
1050					1178	1089	1193	1134	1027	
1100					1202	1092	1152	1090	990	
1150						1101	1097	1040	943	

$$\text{Expansion Factor } c = \frac{\text{Expansion in inches per 100 ft.} \times E \times M_E}{1728 \times 100}$$



NEW EXTENSION, *left,* houses two new 137,000-kw units supplied by 1,100,000-lb-per-hr boilers. Eight silos, each feeding one pulverizer, form street wall of plant building. Brick masonry harmonizes with residential apartments in the neighborhood. Louvered ventilating openings, instead of windows, have sound baffling where needed to confine the plant noise

EAST RIVER Doubles Capacity

Con Edison of N. Y. installs its first condensing high-pressure high-temperature units. The extension departs from plant layout in foundations and coal pulverizing. New units can also heat feed of the existing low-pressure station at gain in over-all station electric heat rate, about 200 Btu per kwhr

► UNITS NO. 5 AND 6 in East River Station in New York City began operating during September and November 1951. Previously all high-pressure high-temperature units on the Con Edison System were the superposed types. These are the first condensing type. The new 137,000-kw units supplement two 60,000-, one 175,000-kw units operating at 375 psig, 700 F; 400 psig, 750 F.

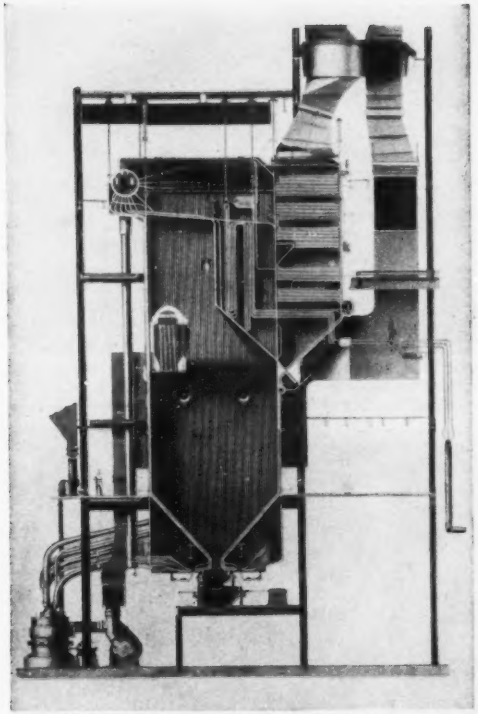
Fuel System. Though the original station used the bin system of pulverized coal firing, the new units have four new mills per boiler for direct firing. A 48-in.-belt conveyor carries raw coal to the eight storage silos. Two stages of magnetic separation and an oscillating screen prevent any foreign matter reaching the feeders or the mills.

To avoid hang-ups, coal passes from silo to feeder through vertical, slightly divergent pipe, then through a vertical pipe to mill. No inclined pipes are used in the raw-coal supply.

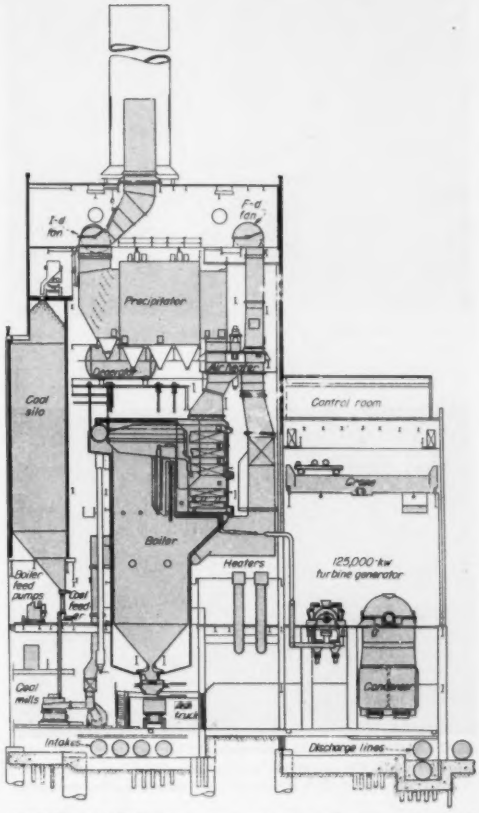
Dry ash from the furnace bottom falls into a double-gated ashpit, see boiler cross section. The upper watercooled internal gates are supported on rollers external to the ashpit. The lower gates of standard design discharge quenched ashes into trucks below.

The upper gates, normally closed, open only to dump into the lower section, minimizing air leakage. An interlock assures following this method of operation.

Feedwater System. The feed-heating steam to the 5-psig deaerator consists



RADIANT, dry-bottom generator supplies 1500-psi 1000-F steam to main steam lead, turbine room, *right,* through 65 3-in. tubes that are connected to superheater outlet header



STATION LAYOUT follows vertical pattern because of limited land availability. All heavy column loads carried individually to rock 100 ft below, old plant has concrete mat on piles

By **H W DIERMAN** *Consolidated Edison Co of New York, Inc*

mostly of exhaust steam from the feed-pump turbine-drives, supplemented by 5-psig steam from the old plant's auxiliary exhaust header. Two sets of closed heaters are provided on the 93- and 330-psia bleed points, after the deaerator to raise water to 423 F. Either set can heat all feed. Set on standby may be used to heat up to 700,000 lb per hr of low-pressure station feedwater from 210 to 401 F. This decreases the station heat rate by 200 Btu per kwhr.

The boiler-feed-pump turbines take steam from the 390-psia 700-F headers of the existing station. This steam exhausts to the deaerator, automatically supplying normal makeup for the unit.

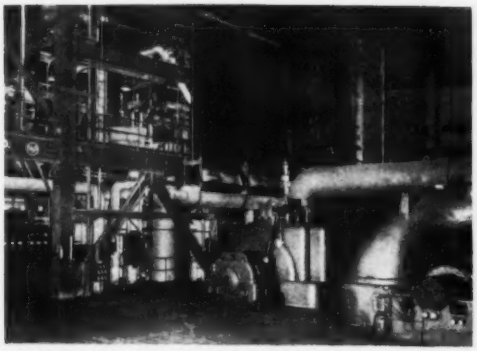
Electrical Features. The existing 25-cycle plant has an electrical gallery for local distribution switching. The new 60-cycle units have their 13.8-kv generator voltage stepped up to 69 kv for transmission to Cherry St, West 19th St, substations. The new high-voltage station bus has ties through transformers to Waterside and Hudson Ave Stations.

Connections to the generator terminals feed one-half of each unit's auxiliaries, with the other half fed from 13-kv station tie feeders. Twenty load-center substations supply energy at 440 and 120/208 volts. The 440-v substations are rated at 1250 kva, the others at 937 kva.

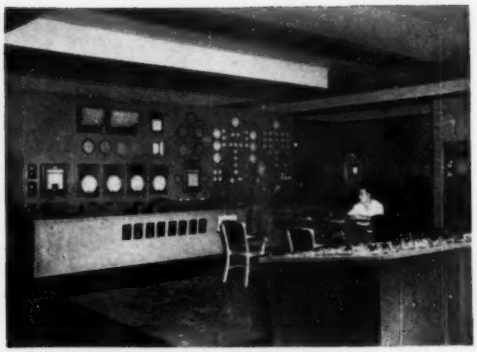
Special Features. To obtain flexibility for movement of the superheater, 65 three-in. tubes connect the superheater outlet header at the boiler to the main steam lead in the turbine room, see station cross section and turbine room photo. Many small tubes are more economical than an expansion loop in the main steam lead. The turbine stop valves are designed to withstand full hydrostatic test pressure on the boiler.

An experimental installation on No. 60 boiler transmits a television picture to the control room for furnace-ignition observation. About 15 ft above the furnace floor, wall tubes were bent to accommodate an air-cooled window through which an air-cooled camera could view burners on the opposite wall. Results have been good. Installation will be completed on No. 60 and extended to No. 50 boiler.

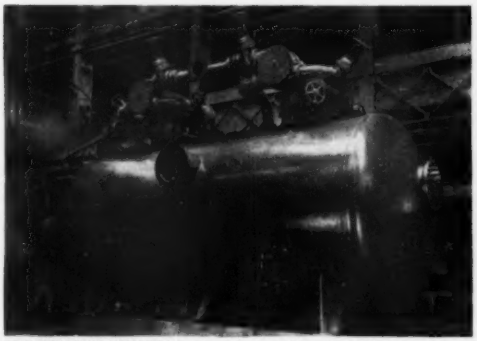
More on next page



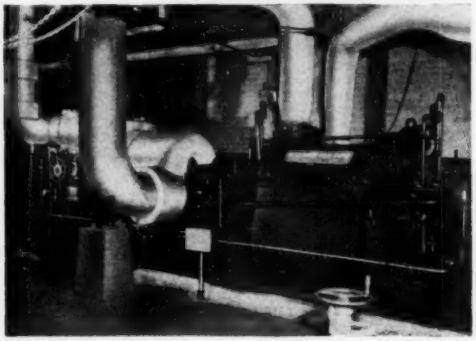
CROSS-COMPOUND 125,000-kw turbines, *right*, fed through 65 tubes enclosed in casing at upper center. Turbine control panel stands at left, vertical feedwater heaters in the rear



CONTROL ROOM supervises boiler operation, electric generator and feeder switching for new Units No. 5 and 6. Main turbine and feed pumps can be tripped but not started from here

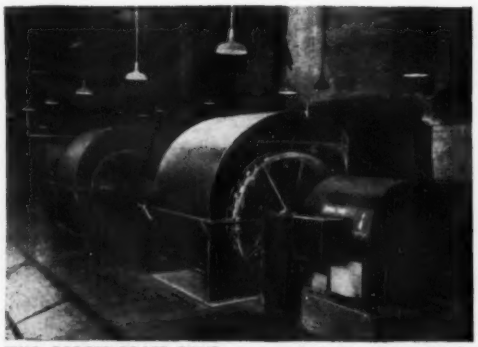


DEAERATING HEATER has two external vent condensers. Heating and deaerating sections occupy upper half of tank, while lower half stores about 60,000 lb heated boiler feedwater

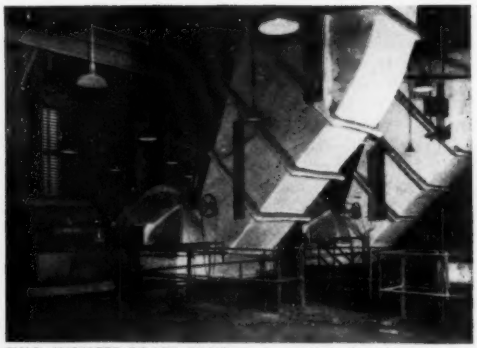


FEEDWATER PUMP driven by turbine supplied from l-p station carries one half of boiler demand. Third pump acts as spare. Exhaust steam feeds deaerator, supplying normal makeup

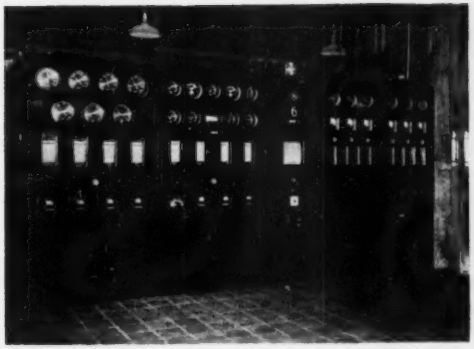
Metropolitan Plant Reflects Advances in Steam-Electric Practice...



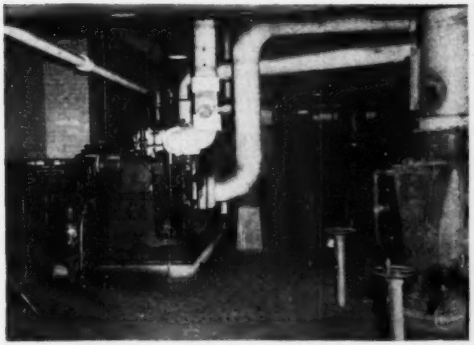
TWO FORCED-DRAFT FANS serve each boiler. Automatically controlled vanes maintain furnace pressure. One fan can supply both boiler-air heaters at half load through the duct tie



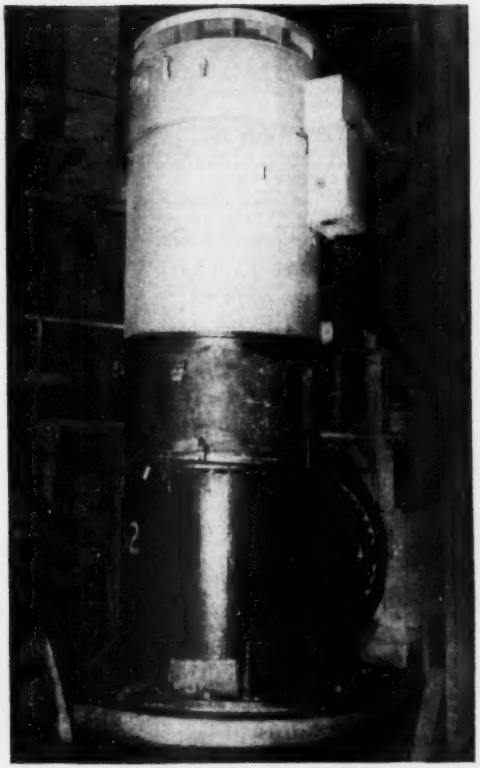
TWO INDUCED-DRAFT FANS serve each boiler, have louver damper controls, and common plenum chamber at fan inlet following precipitator. One fan can carry one-half boiler load



MAIN TURBINE control board for Unit No. 6 stands on turbine-room floor, supervised by turbine operator. Some of these instruments are duplicated on the main control room panels

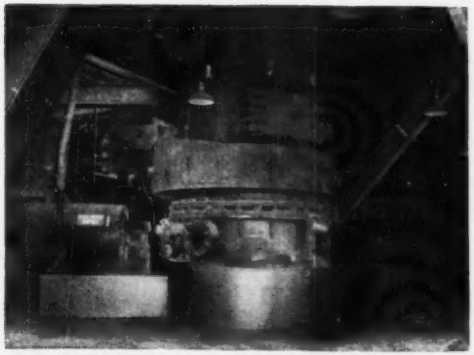


COAL FEEDERS, *right,* and boiler feedwater pumps serving each boiler stand next to each other, directly below coal storage silos, above main coal pulverizers on street level

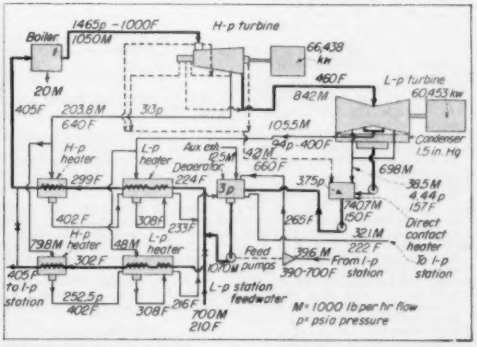


VERTICAL, SUBMERGED, mixed-flow circulating pump. Two serve each condenser through 550-ft-long 72-in.-dia pipes. Butterfly valve at pump discharge prevents reverse water flow

...From Bin to Unit Firing, Common Steam Header to Unit Systems



FOUR COAL MILLS of each boiler feed eight vertical and four horizontal burners. Coal output of individual mills is controlled by primary air damper position up to 15 tph max



MAXIMUM CAPABILITY of units designed for 137,000 kw. Expected rate at 132,000 kw, 10,051 Btu per kwhr, heating extra feed at 120,000 kw, 9397 Btu. (More on next page)

PRINCIPAL POWER PLANT EQUIPMENT

continued

East River Station—Units No. 5 and 6, Consolidated Edison Co of New York, Inc

POWER-GENERATING EQUIPMENT:

Turbine-generators, 2 ..... General Electric Co
137,000 kw, 1450 psig, 1000 F, ¾ in. Hg abs backpressure, cross compound. H-p turbine: 3600 rpm, 12 stages, 8 admission valves, bleed at 8th stage. L-p turbine: 1800 rpm, 10 stages, double flow, bleed at 1st and 7th stages. 3 phase, 0.8 pf, 60 cycle, 13,800 v, hydrogen-cooled generator

Condensers, 2 ..... Ingersoll-Rand Co
95,000 sq ft, single pass, divided waterbox, reheating-deaerating hotwell, 13,940 ⅛-in. No. 18 BWG tubes, 820,000-lb-per-hr steam at 2 in. Hg abs and 113,400 gpm of 75-F circulating water. Four twin-element 2-stage steam-jet air ejectors with inter and after condensers. Eight noncondensing hogging jets.

Circulating-water pumps, 4 ..... Ingersoll-Rand Co
Single stage, vertical, submerged, mixed flow, pull-out type, 59,200 gpm each, 22.4-ft head at 315 rpm

Circulating-water pump drives, 4 ..... General Electric Co
450 hp, 440 v, 3 phase, 60 cycle, totally enclosed, fan cooled

FEEDWATER EQUIPMENT:

Hotwell pumps, 6 ..... Ingersoll-Rand Co
2-stage, vertical, submerged, turbine type, 850 gpm at 80-ft water head, 1765 rpm

Hotwell-pump drives, 6 ..... General Electric Co
25 hp, totally enclosed, fan cooled, 1750 rpm, 440 v, 3 phase

Condensate booster pumps, 6 ..... Ingersoll-Rand Co
1065 gpm at 220-ft head, 1750 rpm, single stage, double suction

Condensate-booster-pump drives, 6 ..... Westinghouse Electric Corp
75 hp, squirrel cage, fan cooled, 1800 rpm, 440 v, 3 phase

Boiler feed pumps, 6 ..... Byron Jackson Co
675,000 lb per hr of 25-psig 220-F water, 1810 psig discharge, 4675 rpm, double casing, 8 stages

Boiler feed-pump drives, 6 ..... General Electric Co
1850 hp, 8 stage, noncondensing steam turbines, 375-psig 700-F throttle steam, 7-psig exhaust

Direct-contact heater, 2 ..... Foster Wheeler Corp
850,000-lb-per-hr water from 85 F to 157.8 F with 61,700 lb-per-hr 4.5-psia steam, jet spray, single-stage twin-element steamjet air ejector and noncondensing hogging jet with each heater

Deaerating heaters, 2 ..... Worthington Corp
1,120,000 lb per hr, 150 to 228 F, max O_2 at 0.005 cc per liter leaving, 2 external-type vent condensers, 1000 cu ft storage

L-p feedwater heaters, 4 ..... Griscom Russell Co
1,120,000 lb per hr, 222 to 313 F, 74,750-lb-per-hr 93-psia steam, 5060 sq ft, 80-20 cupro-nickel tubes, integral drip cooler, vertical U tubes, 2 pass, desuperheating sections

H-p feedwater heaters, 4 ..... Griscom Russell Co
1,120,000 lb per hr, 313 to 425.2 F, 143,000-lb-per-hr 330-psia steam, 4960 sq ft, 80-20 cupro-nickel tubes, vertical U tubes, 2 pass, desuperheating sections

STEAM-GENERATING EQUIPMENT:

Boilers, 2 ..... Babcock & Wilcox Co
Radiant type, 1,000,000 lb per hr continuous, 1,100,000 lb per hr for 14 out of 24 hr of 1500-psig 1000-F steam, single drum, dry bottom, 86,900-cu-ft furnace, 12,842-sq-ft furnace heating surface, 2,020-sq-ft convection surface, 15,600-Btu-per-cu-ft heat release, pulverized-coal fired

Superheaters, 2 ..... Babcock & Wilcox Co
Convection type, 37,953 sq ft, gas bypass around primary section controls outlet steam temperature above 80% of max flow

Economizers, 2 ..... Babcock & Wilcox Co
41,850 sq ft, 2½-in. plain tubes, part counterflow, part parallel flow

Burners, 24 ..... Babcock & Wilcox Co
4 vertical multitip on each of two sides in each furnace firing downward, 2 horizontal burners in each of two sides of each furnace handle about 11% of total fuel when burning lower-volatile coal

Air preheaters, 4 ..... Air Preheater Corp
Regenerative, cold end basketed elements removable for washing, 10-hp 11608-rpm motor drive, rotor speed 1.48 rpm

Pulverizers, 8 ..... Babcock & Wilcox Co
29,500 lb per hr, 80 grindability, 80% through 200 mesh, ball and ring, rotating classifier, 150-hp 585-rpm motor drives

Mill feeders, 8 ..... Babcock & Wilcox Co
Table type, 31-in. dia, 2-speed 2-hp motor drive

Primary air fans, 8 ..... American Blower Corp
20,000 cfm, 30 in. water, 430 F

Primary-air fan drive, 8 ..... General Electric Co
150-hp 1750-rpm electric motors

Forced-draft fans, 4 ..... American Blower Corp
194,000 cfm, 120 F, 12 in. water press. Single-speed inlet-vane control, watercooled bearings

F-d fan drives, 4 ..... Allis-Chalmers Mfg Co
500-hp 880-rpm single-speed motors

Induced-draft fans, 4 ..... American Blower Corp
300,000 cfm, 310-F, 15.5-in. water press. Inlet louver control, single-speed, 585 rpm

I-d fans, 4, 1000-hp 585-rpm motors ..... Allis Chalmers Mfg Co

Coal-handling equipment, 700 tph ..... Wm Neill Constructors, Inc
Three 48-in. belts in series, one 48-in.-dia. magnetic pulley, auto tripper

Coal-handling belts, 3 ..... Robins Conveyors Div, Hewitt Robins Inc

Coal-conveyor drives, 3 ..... General Electric Co
Two 75-hp, one 60-hp motor, 600 rpm, 440 v, 60 cycle

Soot blowers, 32 ..... Diamond Power Specialty Corp
Steam blowing, automatic sequence control, 20 retractable for superheater and economizer, 12 mass blowers for economizer gas bypass

Electrostatic precipitators, 2 ..... Koppers Co, Inc
95% removal at 550,000 cfm of 300-F gas, two electrostatic fields in series, 46 gas lanes, 65,000-v dc field

Bottom ash-handling system ..... Chicago Firebrick Co
Each boiler fitted with 10 double-chambered hoppers discharging to trucks below. Upper and lower chambers separated by water-cooled gates, salt-water quenching sprays

Flyash conveyor ..... Allen-Sherman-Hoff Co
Pneumatic system connecting precipitator hoppers, flues, stacks through cyclone and bag-filter collectors to ash silos, 25 tph

Ash vacuum pumps, 2 ..... Nash Engineering Co
75 hp, motor driven

Flyash unloaders, 4 ..... Chicago Firebrick Co
40 tph, rotary dustless ash conditioners under two 760-ton ash silos, vibrator, 18-in. slide gate, 18-in. rotary vane feeder, rotary drum

MISCELLANEOUS PUMPS:

Chemical feed, 6 ..... Milton Roy Co
Caustic feed: 3, constant speed, 100 psig, 180 F, 20 gph, ¼-hp motor drive. Phosphate feed: 3, constant speed, 1750 psig, 180 F, 2-hp motor drive

Ash-service salt water, 2 ..... Gardner-Denver Co
1000 gpm, 130-ft tdh, 1765 rpm, single-stage double-suction centrifugal

Ash-service salt-water pump drive, 2 ..... General Electric Co
40 hp, 440 v, 3 phase, 1800 rpm

Hydrogen circulating water, 2 ..... Gardner-Denver Co
800 gpm, 50-ft tdh, 1150 rpm, single-stage double-suction centrifugal pump

Hydrogen circulating-water pump drive, 2 ..... Louis Allis Co
15 hp, 440 v, 1200 rpm, totally enclosed motors

Fresh-water pumps, 4 ..... Gardner-Denver Co
300 gpm, 130-ft tdh, 1750 rpm, single-stage double-suction centrifugal

Fresh-water pump drive, 4 ..... Louis Allis Co
15 hp, 440 v, 1800 rpm, totally enclosed

Salt-water booster pumps, 2 ..... Ingersoll-Rand Co
3000 gpm, 10-ft tdh at 690 rpm with 10-ft submergence, vertical mixed flow centrifugal

Salt-water booster-pump drive, 2 ..... Westinghouse Electric Corp
15 hp, 720 rpm, 440 v, 3 phase, 60-cycle motor

Gland seal pumps, 3 ..... Gardner Denver Co
50 gpm, 125-ft tdh, 3460 rpm, horizontal single-stage centrifugal

Gland-seal pump drive, 3 ..... Louis Allis Co
3 hp, 3 phase, 440 v, totally enclosed, fan-cooled motors

Lubricating-oil supply pumps, 4 ..... Viking Pump Co
Three 100 gpm at 100-ft tdh, 420 rpm rotary. One 20 gpm rotary.

Seal-oil pumps, 4 ..... Worthington Corp
25 gpm, 1800 rpm, 2-hp motor drives

Turbine oil pumps, 6 ..... General Electric Co
Four 900 rpm 75-hp 440-v motor-drives pumps. Two 1400-rpm 109-hp turbine-driven pumps

Turning-gear oil pump, 2 ..... General Electric Co
15 hp, 1750 rpm, 440 v, 3-phase motor-driven pump

VALVES:

400-psig-steam gate valves, 300-psig bleed-steam gate valves, 1500-psig feedwater gate valves, 600-psig feedwater gate valves ..... R—P & C Valve Div, American Chain & Cable Co, Inc

1500-psig feedwater check valves ..... Edward Valves, Inc

125-psig water-service gate valves ..... Fairbanks Co

Boiler safety valves ..... Manning, Maxwell & Moore, Inc.

Heater safety valves ..... Crosby Steam Gage & Valve Co

2500-psig quick-start gate valves ..... Walworth Co

2500-psig quick-start globe valves ..... Crane Co

400-psig quick-start safety valves ..... J E Lonergan Co

Atmospheric relief valves ..... Cochrane Corp

Heater nonreturn valves ..... Chapman Valve Mfg Co, Atwood & Morrill Co

Circulating-water butterfly valves, 60 in. ..... Henry Pratt Co

INSTRUMENTS AND CONTROLS:

Combustion control system ..... Republic Flow Meters Co

Feedwater control system, 3 element ..... Bailey Meter Co

Superheater outlet control, 2 element ..... Bailey Meter Co

Feed pump bypass control, 6 ..... Fisher Governor Co

Heater level control ..... Fisher Governor Co

Utilascope television system ..... Diamond Power Specialty Corp

Boiler-water level and furnace observation ..... Crosby Steam Gage & Valve Co, Manning, Maxwell & Moore, Inc, Taylor Instrument Cos

Pressure gages, recorders ..... Helicoid Gage Div, American Chain & Cable Co, Inc, Bristol Co, Foxboro Co, Inc

Pressure and level alarms ..... Mercoid Corp

Thermometers, recording, indicating ..... Moeller Instrument Co, Bristol Co, Taylor Instrument Cos, Leeds & Northrup Co, Brown Instrument Div, Weston Electrical Instrument Corp, Foxboro Co, Inc

Bearing temperature monitors ..... Instrument Div, Thomas A Edison Inc

Draft gages ..... Hays Corp

Level indicators, recorders ..... Bristol Co, Diamond Power Specialty Corp, Brown Instrument Div, Uehling Instrument Co

pH recorder ..... Bristol Co

Oxygen recorder ..... Cambridge Instrument Co

CO_2 recorder ..... Leeds & Northrup Co

Conductivity recorder ..... Leeds & Northrup Co, Industrial Instrument Co

Tachometer ..... James G Biddle Co

Flowmeters ..... Bristol Co, Bailey Meter Co, Builders-Providence Inc, Foxboro Co, Republic Flow Meters Co

MISCELLANEOUS EQUIPMENT:

Air compressor, 1 ..... Chicago Pneumatic Tool Co
2 stage, air cooled, 150 cfm at 100 psig, directly driven by 40-hp 900-rpm 440-v motor

Aftercooler, 1 ..... Modine Manufacturing Co
Air-cooled, 160 cfm at 100 psig from 290 to 100 F, 1/3 hp fan motor, 1150 rpm

Air receiver, 1 ..... Westinghouse Air Brake Co
200 gallon, 125 psig, enameled interior and exterior

Desuperheaters, 2 ..... Republic Flow Meters Co
300,000-lb-per-hr starting steam reduced to 400 psig, 790 F

Power's DATA SHEET

No. 244

Alloy Steel Pipe—ASTM Specifications A-206 Grade P-1 (½% moly) and A-280 (½% cr, ½% moly)

Pipe size	Nom. OD	Wall thick.	Temperature – F: To 750	800	850	900	950	1000
in.	in.	in.	Maximum allowable stress – psi: 13,750	13,450	13,150	12,500	10,000	6250
Schedule 10								
14	14	.250	303	296	289	275	220	137
16	16	.250	261	255	250	237	190	118
18	18	.250	234	228	223	212	170	106
20	20	.250	206	201	197	187	150	93
24	24	.250	178	175	171	162	130	81
Schedule 20								
8	8.625	.250	495	484	473	450	360	225
10	10.75	.250	399	390	381	362	290	181
12	12.75	.250	330	323	315	300	240	150
14	14	.312	413	404	394	375	300	187
16	16	.312	357	350	342	325	260	162
18	18	.312	316	309	302	287	230	143
20	20	.375	371	363	355	337	270	168
24	24	.375	303	296	289	275	220	137
Schedule 30								
8	8.625	.277	577	565	552	525	420	262
10	10.75	.307	522	511	500	475	380	237
12	12.75	.330	495	484	473	450	360	225
14	14	.375	522	511	500	475	380	237
16	16	.375	454	444	434	412	330	206
18	18	.437	495	484	473	450	360	225
20	20	.500	522	511	500	475	380	237
24	24	.562	495	484	473	450	360	225
Schedule 40								
¼	.840	.109	1554	1520	1486	1412	1130	706
⅜	1.05	.113	1334	1304	1275	1212	970	606
1	1.315	.133	1440	1412	1380	1312	1050	656
1¼	1.66	.14	976	955	933	887	710	444
1½	1.90	.145	921	901	881	838	670	419
2	2.375	.154	825	807	789	750	600	375
2½	2.875	.203	1114	1089	1065	1012	810	506
3	3.50	.216	1004	982	960	913	730	456
4	4.50	.237	894	874	855	813	650	406
5	5.563	.258	811	794	775	737	590	369
6	6.625	.28	770	753	736	700	560	350
8	8.625	.322	701	686	671	637	510	318
10	10.75	.365	660	646	631	600	480	300
12	12.75	.406	633	618	605	575	460	287
14	14	.437	633	618	605	575	460	287
16	16	.50	646	632	618	588	470	294
18	18	.562	660	646	631	600	480	300
20	20	.593	633	618	605	575	460	287
24	24	.687	619	606	592	563	450	281
Schedule 60								
8	8.625	.406	949	928	908	863	690	431
10	10.75	.50	976	955	933	887	710	444
12	12.75	.562	949	928	908	863	690	431
14	14	.593	921	901	881	838	670	419
16	16	.656	894	874	855	813	650	406
18	18	.718	921	901	881	838	670	419
20	20	.812	908	888	867	825	660	413
24	24	.937	921	901	881	838	670	419
Schedule 80								
¼	.84	.147	2777	2717	2656	2525	2020	1262
⅜	1.05	.154	2378	2326	2275	2162	1730	1081
1	1.315	.179	2378	2326	2275	2162	1730	1081
1¼	1.66	.191	1773	1735	1696	1613	1290	806
1½	1.90	.20	1663	1627	1591	1512	1210	756
2	2.375	.218	1526	1493	1460	1388	1110	694
2½	2.875	.276	1773	1735	1696	1613	1290	806
3	3.50	.30	1622	1587	1551	1475	1180	738
4	4.50	.337	1471	1439	1407	1338	1070	668
5	5.563	.375	1348	1318	1288	1225	980	613
6	6.625	.432	1348	1318	1288	1225	980	613
8	8.625	.50	1223	1197	1170	1112	890	556
10	10.75	.593	1196	1170	1144	1088	870	544
12	12.75	.687	1196	1170	1144	1088	870	544
14	14	.75	1196	1170	1144	1088	870	544
16	16	.843	1196	1170	1144	1088	870	544
18	18	.937	1196	1170	1144	1088	870	544
20	20	1.031	1196	1170	1144	1088	870	544
24	24	1.218	1182	1156	1130	1075	860	537

Pipe size	Nom. OD	Wall thick.	Temperature – F: To 750	800	850	900	950	1000
in.	in.	in.	Maximum allowable stress – psi: 13,750	13,450	13,150	12,500	10,000	6250
Schedule 100								
8	8.625	.593	1512	1479	1446	1375	1100	687
10	10.75	.718	1499	1466	1433	1362	1090	681
12	12.75	.843	1512	1479	1446	1375	1100	687
14	14	.937	1554	1520	1486	1412	1130	706
16	16	1.03	1499	1466	1433	1362	1090	681
18	18	1.156	1512	1479	1446	1375	1100	687
20	20	1.25	1512	1479	1446	1375	1100	687
24	24	1.50	1526	1493	1460	1388	1110	694
Schedule 120								
4	4.50	.437	2048	2004	1959	1862	1490	931
5	5.563	.50	1952	1910	1867	1775	1420	888
6	6.625	.562	1870	1829	1788	1700	1360	850
8	8.625	.718	1897	1856	1815	1725	1380	863
10	10.75	.843	1815	1775	1736	1650	1320	825
12	12.75	1.00	1842	1802	1762	1675	1340	837
14	14	1.062	1842	1802	1762	1675	1340	837
16	16	1.218	1815	1775	1736	1650	1320	825
18	18	1.343	1829	1789	1749	1662	1330	831
20	20	1.50	1801	1762	1722	1637	1310	819
24	24	1.75	1829	1789	1748	1662	1330	831
Schedule 140								
8	8.625	.812	2186	2139	2090	1987	1590	994
10	10.75	1.00	2200	2152	2104	2000	1600	1000
12	12.75	1.125	2104	2058	2011	1913	1530	957
14	14	1.25	2145	2098	2051	1950	1560	975
16	16	1.437	2172	2125	2078	1975	1580	988
18	18	1.562	2117	2071	2025	1925	1540	963
20	20	1.75	2145	2098	2051	1950	1560	975
24	24	2.062	2117	2071	2025	1925	1540	963
Schedule 160								
½	.84	.187	4166	4075	3984	3787	3030	1894
¾	1.05	.218	4125	4035	3945	3750	3000	1875
1	1.315	.25	3932	3846	3760	3575	2860	1787
1¼	1.66	.25	2750	2690	2630	2500	2000	1250
1½	1.9	.281	2832	2770	2709	2575	2060	1288
2	2.375	.343	2956	2891	2827	2687	2150	1344
2½	2.875	.375	2722	2663	2603	2475	1980	1237
3	3.50	.437	2695	2636	2577	2450	1960	1225
4	4.50	.531	2626	2569	2511	2388	1910	1193
5	5.563	.625	2557	2501	2445	2325	1860	1162
6	6.625	.718	2500	2448	2393	2275	1820	1138
8	8.625	.906	2489	2434	2380	2262	1810	1131
10	10.75	1.125	2530	2474	2420	2300	1840	1150
12	12.75	1.312	2502	2448	2393	2275	1820	1138
14	14	1.406	2447	2394	2340	2225	1780	1112
16	16	1.562	2447	2394	2340	2225	1780	1112
18	18	1.75	2447	2394	2340	2225	1780	1112
20	20	1.937	2434	2380	2328	2212	1770	1106
24	24	2.312	2434	2380	2328	2212	1770	1106

Maximum Allowable Working Pressure—3

► HERE'S THE THIRD of six handy data sheets to speed up selection of pipe sizes. No. 1 appeared in July, No. 2 in September. These tables help avoid errors in pipe design calculations.

Tables are based on allowable stresses published in the August 1951 issue of *Mechanical Engineering* and the p/s values given in the Crane Co catalog No. 49.

By GEORGE C HALZEL *Boston, Mass.*

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Let it rain - Let it pour - High Moisture

This is typical of the experiences of RILEY "50" pulverizer users

"The mills and feeders are performing in a very satisfactory manner. We had a twenty-four hour rain and the coal was so wet, water ran back on the belts to the bunkers. We had considerable trouble with some of our mills, the Riley's didn't seem to notice there was anything different about the coal. The test you ran here may not have been conclusive but after what we went through I believe you can quit thinking about moisture. It seems to have no effect upon your equipment."

An unsolicited letter from a large Midwest Public Utility

TRADE MARK Rx REGISTERED

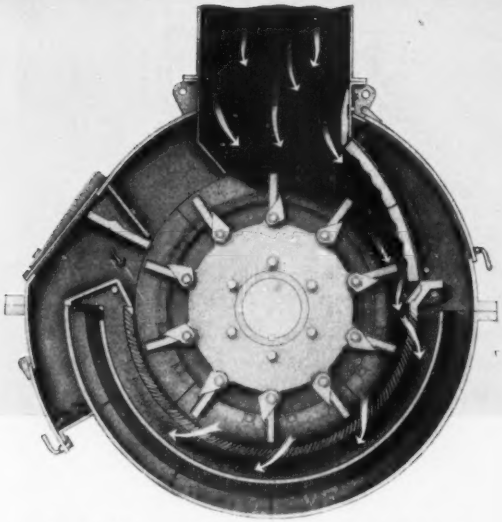
RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston · New York · Philadelphia · Washington · Buffalo · Pittsburgh · Cleveland · Detroit · Chicago
Cincinnati · Charlotte · Atlanta · New Orleans · St. Louis · Kansas City · St. Paul · Tulsa · Houston
Denver · Salt Lake City · Los Angeles · Portland · Seattle

BOILERS · PULVERIZERS · BURNERS · STOKERS · SUPERHEATERS · ECONOMIZERS

makes no difference to RILEY "50" Pulverizers



Crusher-Dryer Section

The crusher-dryer section, the first stage of the new Riley "50" pulverizer evaporates all free moisture in the coal if adequate primary air temperatures are provided so that moisture has no effect upon capacity or power consumption.

The crusher-dryer section not only dries the coal but it also rejects all foreign materials and crushes the coal to a fine granular state—at least 40% will pass a 50-mesh screen. This section also eliminates possibility of damage to the pulverizer by foreign materials as no material larger than 1/4" can enter the final pulverizing stage.

Parts faced with tungsten carbides

To minimize maintenance and to assure long periods of continuous operation with sustained fineness, pulverizing elements are faced with tungsten carbide. A six-ton per hour Riley pulverizer equipped with tungsten carbide parts in September 1948 has pulverized over 80,000 tons of coal with no falling off of fineness and with but slight wear of tungsten carbide facing. See illustration of new and used parts at right. The use of tungsten carbide has greatly reduced maintenance material costs and tremendously reduced maintenance labor costs.

Riley "50" Pulverizers give you all these other significant advantages . . . .

- Quiet vibrationless operation
- Explosion proof
- Flexibility—wide load range
- Ability to carry extremely low loads
- Low power consumption
- Ease of regulation
- Small space required
- Minimum foundation cost
- Parts easily renewed
- Can be operated without coal feed
- Ease of ignition
- Low lubrication cost
- No worms or gears—Just two bearings
- High primary air temperatures

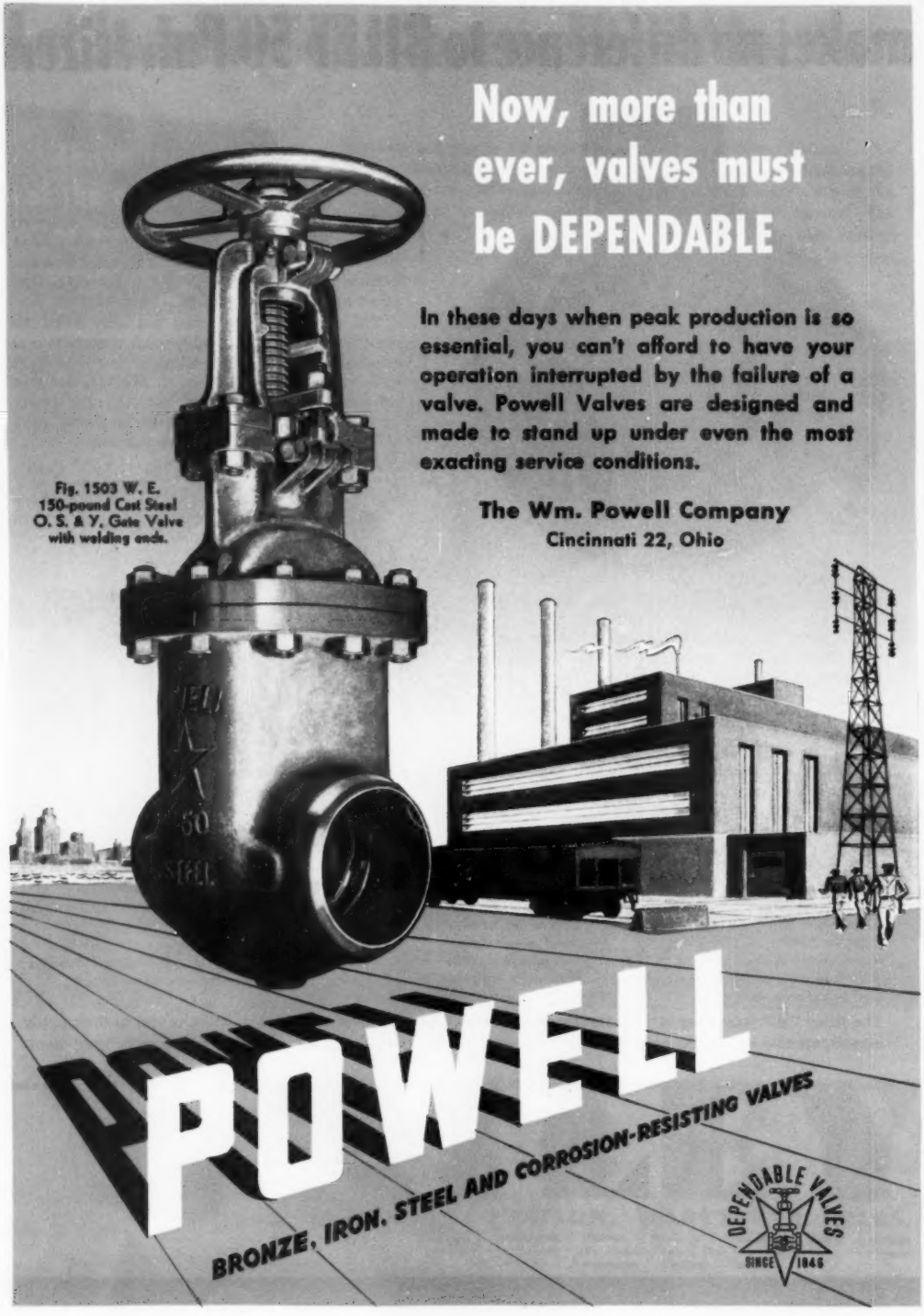
The Riley "50" pulverizer is the latest development in the coal pulverizing field. It will pay you to thoroughly investigate this significant pulverizer development when considering additional coal pulverizing equipment.

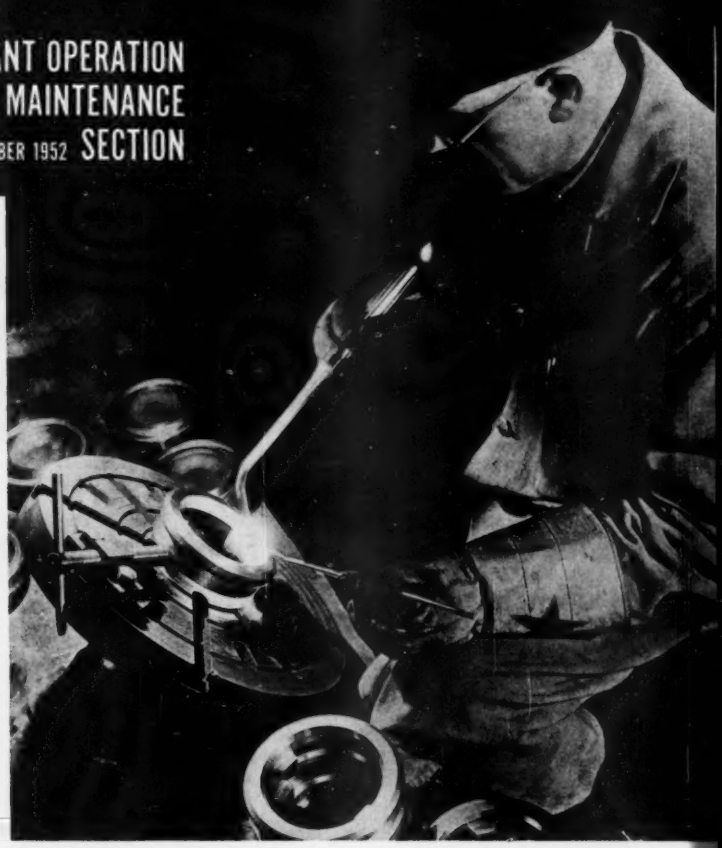
A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS


Now, more than ever, valves must be DEPENDABLE
In these days when peak production is so essential, you can't afford to have your operation interrupted by the failure of a valve. Powell Valves are designed and made to stand up under even the most exacting service conditions.
The Wm. Powell Company
Cincinnati 22, Ohio
Fig. 1503 W. E. 150-pound Cast Steel O. S. & Y. Gate Valve with welding ends.
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES SINCE 1846



COAL screw protected with hard overlay

VALVE INSERT seats are hard-surfaced to withstand high temperature, wire drawing

'Save That Surface'

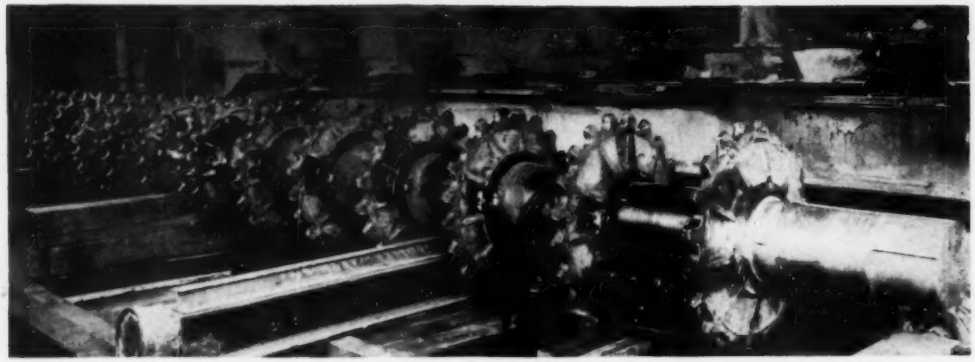
says Russ Kembel, Bethlehem Steel Co

- **Thin hard-surface increases normal life of expensive parts**
- **Build up badly worn parts with cheaper rods, finish hard**
- **Hard-surfacing is a "natural" for power field**
- **Rods are made to resist wear, abrasion, corrosion, impact**
- **Some alloys remain hard though operating at red heat**
- **Apply with electric arc or oxyacetylene**

► HARD-FACING is rapidly becoming an important part of maintenance welding in many industries. This is the process of applying extremely hard alloys to surface of a softer metal. That increases its resistance to wear, abrasion, corrosion or impact. It's accepted as the most effective means of extending life of machines and equipment subjected to severe wear in operation.

Wearing surfaces of tools, drills, cutters or other parts, when treated with these special alloys, outwear common steels two to 20 times, depending on alloy used and service.

Alloys. No single hard-facing mate-



STOKER DRIVE SHAFT is badly worn at main bearing journals from coal dust finding way into bearings. Shaft assembly is pulled out here for overlaying worn sections with hard-surfacing alloys. That saves cost of new shaft, lasts longer

Hard-Facing Metals Come in Five Groups, Solve Many Different Problems

rial is right for all jobs. There are many types of alloys to meet various needs for hardness, toughness, shock and wear resistance, and other special qualities. They fall into five groups.

Group 1 consists of alloys that usually have an iron base of less than 20% alloying elements. Such elements are mainly chromium, tungsten, manganese, silicon and carbon. Alloys in this class have a greater wear resistance than any machine steel. Although not as hard, they have greater toughness and shock resistance than other hard-facing alloys. Use to build up badly worn sections before applying a final harder surface with a better grade of hard-facing alloy.

Group 2 consists of iron-base alloys of 50 to 80% iron and more than 20% alloying elements. Alloying elements are mainly chromium, tungsten, manganese, silicon and carbon. Small percentages of cobalt and nickel are sometimes added. Some alloys in this class have property of "red hardness," that is, they remain hard even though operating at a red heat. Use for final hard, wear-resisting surface after worn part is built up with a high-strength rod. Though not as shock-resistant or as tough as the Group 1 alloys, they are harder and more abrasive-resistant, give longer service.

Broken edges of high-carbon or high-tensile, low-alloy steels in the heat-treated condition are repaired by the transition-bead method. This means welding another metal or metals to base metal before applying hard-facing material. Here's how the job is done: (1) Grind, chip or machine broken or worn surface to clean the break. (2) Deposit a thin layer of stainless steel, made up, for instance, of 25% chromium, 20% nickel rod, or 18% chromium, 8% nickel rod containing columbium. (3) Build up section to about original dimension, using an 11 to 14% manganese steel or high-strength rod. (4) Hard-surface with one of Group 2 alloys.

Group 3 consists of nonferrous alloys of cobalt, chromium and tungsten, and other nonferrous hard-facing metals. Some of these also have property of red hardness. They come in several grades, all highly resistant to wear but possessing a toughness and spread in strength that gives them a wide variety of applications.

Group 4 consists of so-called carbide materials or diamond substitutes. They are hardest and most wear-resistant of all hard-facing materials. Some contain 90 to 95% tungsten carbide. Remaining 5 to 10% is cobalt, nickel, iron or similar metals added to give strength, toughness, heat resistance and impact strength to tungsten carbide. Some are almost pure tungsten carbide, containing no alloying elements.

Materials or alloys in this group are furnished as small castings, welded onto wearing surface with other metals. Heat of oxyacetylene flame or electric arc does not melt carbide materials. But they are readily "wetted," thus easily bonded to other metals or hard-facing alloys. Application of tungsten carbide pieces to wearing surfaces is known as "hard setting." Excellent abrasion- and wear-resistant surface, having good red-hardness properties, is obtained by setting tungsten carbide pieces with a hard-facing alloy.

Group 5 consists of crushed tungsten carbides of various screen sizes. These are fused to strips of mild- or low-alloy steel, embedded in a hard-facing material, or high-strength rod, or packed in mild steel tubes of various diameters. All these types are made in short lengths for applying to wearing surface as welding rods. Crushed tungsten carbides also come in loose form as granular pieces or powder. Sprinkle onto wearing surface and melt into it. Although these materials are more expensive than best hard-facing alloys, they have many applications because of their long life.

Metals to Be Hard-Surfaced. Hard-facing materials and rods work well on following metals and alloys:

1. Low- and medium-carbon steels. All plain carbon steels with carbon content up to 0.50% can be hard-faced by either oxyacetylene or electric arc.

2. High-carbon steels, of above 0.50% carbon, can also be hard-faced by either oxyacetylene or electric arc. On some jobs heat-treat base metal before and after hard-facing. This removes hardness and brittleness, prevents cracking. Transition-bead method described may be used to hard-face these steels in the heat-treated condition.

3. Low-alloy steels. Apply hard-facing to these steels same as to plain carbon steels. In some cases, depending on composition of base metal, heat-treat after hard-facing.

4. High-speed steels. Hard-facing these steels is not generally recommended. This is because, regardless of heat treatment, brittleness and shrinkage cracks develop in base metal after hard-facing. This makes hard-faced piece valueless.

5. Manganese steels (11 to 14% manganese). Metal arc-welding process

only is recommended for applying hard-facing materials to manganese steels. Avoid over-heating by cooling manganese base metal only. Apply welding heat uniformly. Peen deposit to relieve cooling stresses.

6. Stainless steels, including high-chromium and chromium-nickel steels, can be easily hard-faced by either oxyacetylene or electric arc. Know physical properties of each type of stainless steel. That avoids brittleness or decreased corrosion resistance after hard-facing. Also heat uniformly and cool slowly to avoid warping or cracking, due to stainless steel's higher coefficient of expansion.

7. Cast iron. Gray and alloy cast iron is hard-faced by either oxyacetylene or electric arc. Since cast iron's melting point is lower than steel's, take care in working thin edges.

8. Malleable iron. Hard-facing is applied to malleable iron, but iron under hard-facing is hardened by heat in process. Some of this hardness can be removed by reheating malleable iron to above 1500 F.

9. Monel metal is easily hard-faced.

10. Brass and bronze. Since melting point of brass, bronze and other alloys is low, hard-facing cannot be applied well. In some cases, heavy sections preheated to a red heat can be hard-faced by electric arc.

11. Copper and copper alloys have high heat conductivity and relatively low melting points. They can be hard-faced only under conditions applying to brasses and bronzes.

12. Aluminum and aluminum alloys cannot be hard-faced.

Hard-Surfacing. Before applying a hard-facing material, determine job's operating conditions, also type of wear expected. One or more of following conditions may be present to increase wear: shock and impact, heat, corrosion, sliding or rolling friction and abrasion.

In rock-crushing and similar equipment where resistance to shock and impact are most important, hardness is secondary. Use hard-facing alloys of Groups 1 and 2.

Valves for handling gas, oil, acids, and high-temperature and high-pressure steam must resist heat, corrosion and erosion. Use Group 3 alloys here, as well as for internal-combustion engine valve seats because of their properties of red-hardness and corrosion resistance.

Group 4 and 5 alloys are tough and extremely hard. Use where wearing parts contact earth, sand and gravel, as on road-scraping blades and grading equipment. Also rotary drilling bits, steam-shovel teeth, or where you need high resistance to abrasion.

Materials classified under group numbers are available under various trade names. Rod forms are suitable for use with either electric arc or oxyacetylene process.

In electric arc welding, hard-facing electrodes have a flux coating that serves same purpose as flux in oxyacetylene process. No added flux is needed.

Every hard-facing metal, except for some of Group 5 alloys, is applied in either coated or bare electrodes, with reversed polarity. Flux coating on coated electrodes reduces spatter loss, assures good penetration, prevents oxidation of deposited metal, and helps to stabilize the arc. Bare hard-facing electrodes are used only for applying heavy bead, or to deposit metal against a copper form. For best results, deposit metal with as long an arc as possible. Set voltage up all the way and adjust current for thickness of base metal and the exact type and size hard-facing rod.

Use this table as a guide for current settings of hard-facing electrodes:

Rod size, in.	*Current, amp*
1/8	100 to 150
3/16	150 to 200
1/4	200 to 250

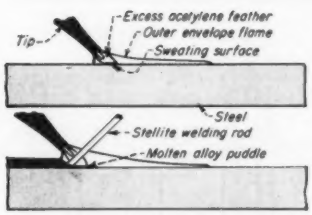
Power-Plant Uses. Most hard-surfacing can be done with standard equipment found in the average plant-maintenance shops. And most of it can be done by any good welder who uses common sense in sizing up each job. On the other hand, a careless welder can damage expensive equipment permanently.

Some applications are: ash-conveyor drag-line links, induced-draft fan and housing, pulverizer hammers, coal feed dogs, gate and globe valve seats and disks, gas-engine valve seats, boiler tube cleaners, needle valves and nozzles, crusher teeth, coal feeder screws, lifter and valve cams, nipples, diesel-engine valves, valve seat inserts and high-temperature steam valves.

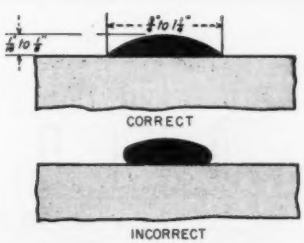
One precaution when doing this work is to have area well ventilated. It pays to hook up a blower or fan to carry away fumes of hard-surfacing metals.

Welding research goes on every day. Hard-facing has been developed to keep the power services and production rolling. Be sure to cash in on it.

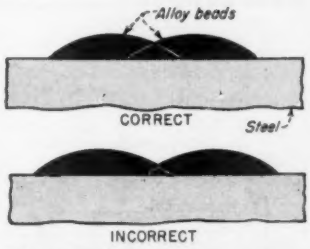
Some Handy Tips on Doing the Work



SWEATING and relationship of tip, rod, puddle and base metal while hard-facing



SINGLE BEAD is laid to this approximate width and thickness, at right temperature

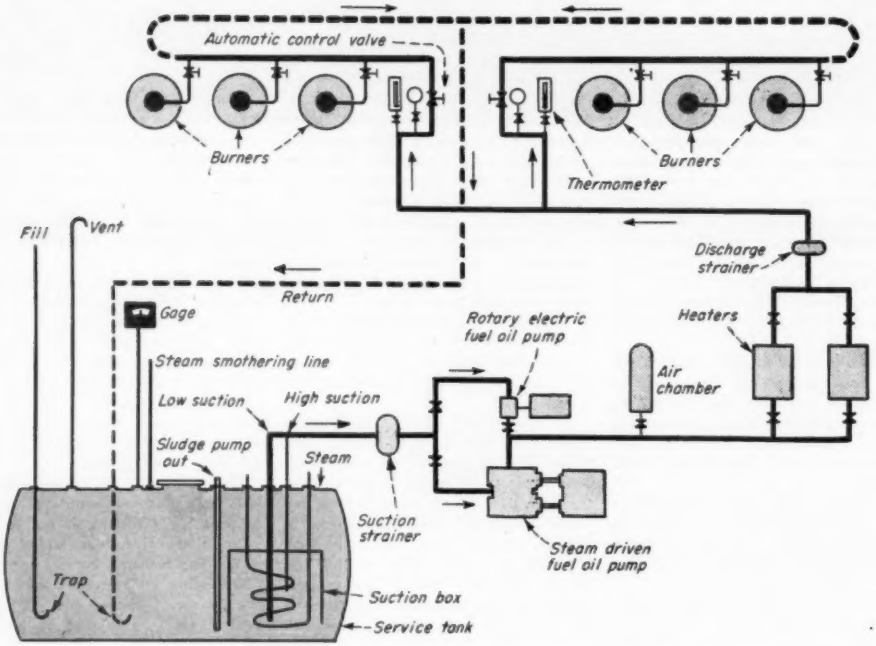


SECOND BEAD overlaps first, as shown, by about one-third width of bead at base

OPERATORS' NOTEBOOK 57

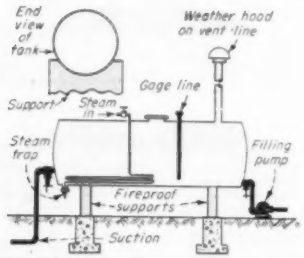
Pipe Your Fuel Tank...

THE OIL SYSTEM

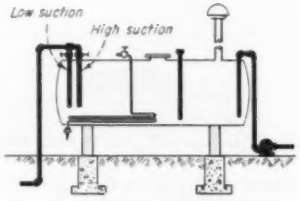


1 Here's a good hookup for industrial system burning heavy oil. Oil is preheated in storage tank for easy pumping. Suction and discharge strainers keep burner tips from plugging. Both steam and electric service pumps safeguard against most plant emergencies. Air chamber prevents joints leaking with burners closed, also dampens pulsations. Oil heaters keep oil at fire point. Return lines purge air into storage tank with unused oil. System is preferable to one with dead ends

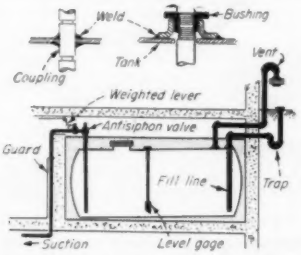
ABOVEGROUND



7 Horizontal aboveground tank must have a fireproof support under one third of circumference. Here oil enters, leaves tank near bottom from both ends



8 Safer way to hook up same tank is to run fill line above tank and down inside. High and low suction lines with valve at the top assure against leakage

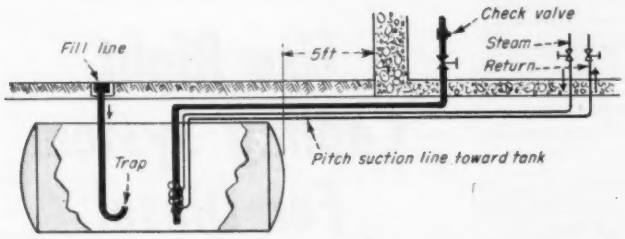


9 Inclose indoor tank in concrete box and cover with sand. Protect suction line from damage. Connect piping to tank with welded couplings or bushings

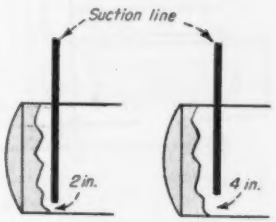
...For Best Results

By **STEVE ELONKA**, *Associate Editor*

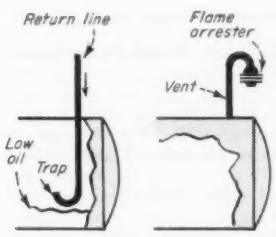
PIPING DETAILS



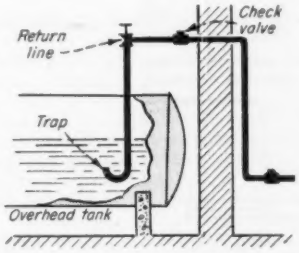
2 Buried-tank capacity is usually less than 30,000 gal. It must be at least 5 ft. from building foundation, should be below all outlets attached to tank. Fill line should be below suction-line level, or it must have a trap so it won't act as vent. Pitch suction line toward tank; install check and shutoff valves near tank



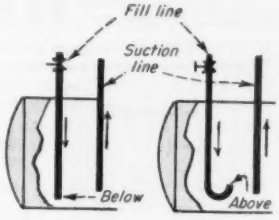
3 Have the suction 2 in. from tank bottom for light oil, 4 in. for heavy oil. That keeps sludge, water, sediment out of the system. Remove impurities yearly.



4 Trap on return line prevents vapors escaping when oil is low. Tie vent in top of tank, have flame arrester. Size vent to prevent pressure when filling

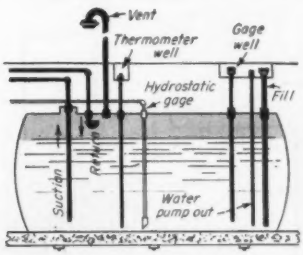


5 For aboveground tank, place check valve in return oil line as shown. That prevents siphoning oil out of the tank. Also have trap on end of the line

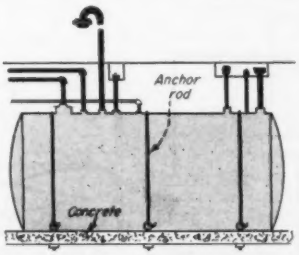


6 Extend fill line below suction line or place a trap on fill line's end so it cannot vent. Don't cross-connect fill line with any other lines, or to vent

BURIED



10 Safest oil storage is underground tank. Line for pumping out water and sludge is needed in large tank. Piping hookups shown are based on good practice



11 Heavy underground tanks sink, cause trouble unless buried in good spot. To prevent floating in wet ground, lay on a concrete slab, anchored with rods

REFERENCES

Install tank and piping right, by getting more information from:

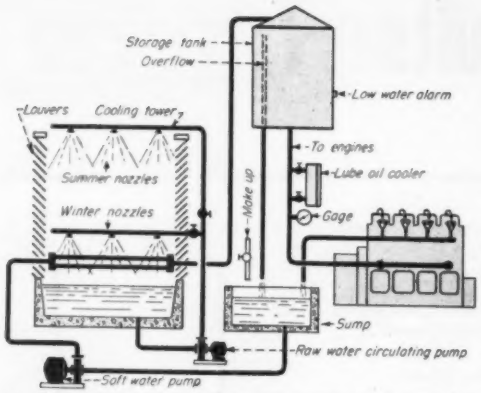
Associated Factory Mutual Fire Ins. Co., Inspection Dept., 184 High St., Boston 10, Mass., *Bulletin No. 13.23*, June 1944.

The North American Manufacturing Co, Cleveland 5, Ohio, 1952, *North American Combustion Handbook*.

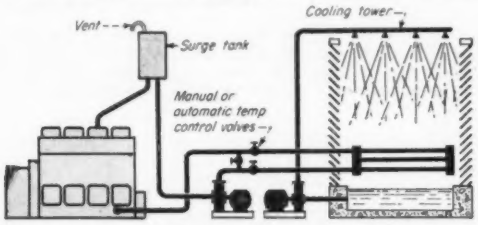
National Board of Fire Underwriters, 85 John St., New York 7, N.Y., *Standards of Installation of Oil Burning Equipments, NBFU No. 31*, Sept. 1951.

Use Right Cooling System For Diesel

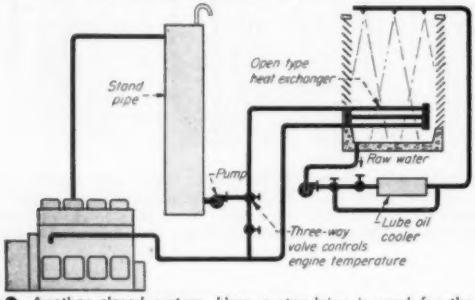
Closed system is best, but there are many hookups, depending on service and cooling water available. C Morgan Jones shows how to adapt each system to your needs, other things to consider



1 Closed system, with cooling tower, storage tank, sump, has open funnels from cylinder returns to check temperature



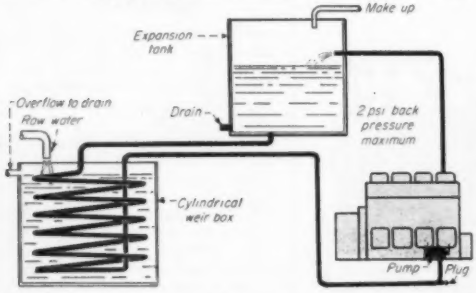
2 If no place for a large water-storage tank, this closed system with cooling tower does very good job of cooling



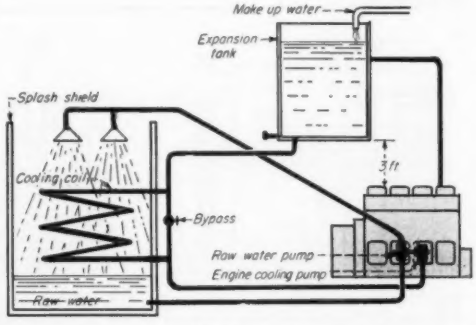
3 Another closed system. Here a standpipe is used for the water storage; engine temperature is controlled by valves

► NEARBY FROG POND, hooked up for cooling your diesel engine, may seem like an inexpensive solution, but it's actually the most costly. For one thing, if the water's hardness exceeds five grains per gallon, don't circulate it through your engine.

Closed System. One of best cooling systems is the closed type, Fig. 1. Water is pumped through open heat exchangers in a cooling tower. Raw water sprays over heat-exchanger tubes or coils, removing most heat by evaporation and conduction. Big advantage is that raw water does not contact



4 Reliable system for small power plant or standby unit; 2 pumps for raw and engine-cooling water are engine driven



5 For engine of about 200 bhp that's located where raw water is plentiful, use this system with weir-exchanger type box

engine's jackets to deposit many of its harmful impurities.

Another good point is excellent control of engine-water temperature under all loads. Since cooling water circulates continuously without much loss, soft or even distilled water can be used. Chemically treating soft water prevents scale forming in engine jackets.

Have water-supply tank, Fig. 1, large enough to hold 5 to 12 gal per engine hp, or 25 gal for every gallon of water circulated through the engine per minute. If this figure is used and circulation rate is 200 gpm, make tank capacity 5000 gal. The larger the tank, the better. That allows engine to run longer after trouble in cooling system, such as a pump failure.

For operator, there's a great advantage in cooling-water flow at constant volume and uniform velocity. Velocity is from gravity, so supply tank must be above engine. A fair height is 25 to 30 ft.

Another good feature of system is that operator can check discharge temperature of each cylinder's discharge into open funnel-type drains. A sharp temperature rise shows there's something wrong in that cylinder. That avoids hit-or-miss guesses in finding trouble.

Hotwell or sump must hold at least 5 gal of water for each gallon circulated per minute through engine. If possible, make large enough to hold 1½ times quantity held in tank. Then if any part of system fails, all water in tank, exchanger, engine and piping can be drained into sump for future use.

Lead makeup water line to the hotwell. If float-operated, it needs little attention, except occasional check to see that float has not jammed.

Amount of raw water circulated through spray nozzles should equal amount of soft water in supply tank. That's about 6 gal per engine hp. This can be reduced if high engine cooling-water temperatures are OK, but take engine maker's word. Protect raw-water basin against frost by digging it deep enough, or locate in engine room. If outdoors, extend walls of basin high enough to prevent entrance of rain runoff.

If tower is on roof, raw water must be stored in a tank of suitable size.

Install a 3-way manually or automatically operated valve between soft-water line and heat exchanger. That controls temperature of soft water by directing some of uncooled liquid to engine supply tank for maintaining most required temperatures.

Cooling Tower. Type of tower depends on plant's location. If roof is sound, you're in luck. Then you can forget first and future costs of an electric motor for mechanical draft tower.

If an outdoor installation is favored but locality has very low winter temperatures, cut raw-water line supplying tower spray nozzles into a secondary nozzle line. Locate about one-third way between summer nozzles at tower's top and heat exchanger. Use these nozzles in winter, when there's too much cooling from upper nozzles. Lower nozzles should be coarser, fewer in number. Should this sprayed water still be too cold, cut off spray and circulate water through storage tank.

Cost of this installation is reasonable because of lower insurance rates and better operation. A 1000-hp unit usually takes a motor-driven circulating pump of 7 to 8 hp.

Different Systems. When you can't install a tower outdoors, or if it cannot be placed in a good spot outdoors, substitute a mechanical-draft tower. If location does not permit a large cooling-water storage tank, use system in Fig. 2 where storage tank is not used.

Stand-pipe system is shown in Fig. 3.

If more than one engine, install a soft-water pump for each engine. One pump is OK when it runs. But if trouble develops, pump shuts down all engines.

A small cooling tower for a small power plant or standby unit is shown in Fig. 4. It has two engine-driven pumps.

Fig. 5 has a simple weir-box heat exchanger. Shell-and-tube coolers can also be used. Of course simplest way is to install an open heat exchanger in a pond or stream.

If water is to be cooled through radiators because of plant location, it's better to power radiator's fan independently. If fan is engine-driven, it revolves at a fairly constant speed. That offsets atmospheric temperature changes even if fan has adjustable louvers.

High temperature can be carried with radiators because cooling-water losses are low, little makeup is needed. Replenish from chemically treated soft-water reserves or fresh filtered rain water, as needed. Always provide radiator with a fan motor of about twice normal size. Then during hot weather, fan speed can be increased. You can do this with two sets of pulleys. Radiators can also be used for plant heating.

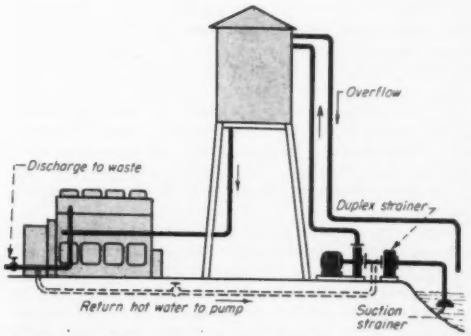
Cooling capacities of radiators depend on velocity of cooling air and its temperature. Radiators hold little water so install an automatic shutdown device to stop plant when water level drops low if temperature climbs to danger zones.

Open cooling systems are cheapest to install but they can only be used if there's plenty of soft water available, Fig. 6. Have tank capacity of 5 to 10 gal per engine hp. Locate 25 to 30 ft above engine's top. Fit tank with bell or horn on low-water alarm. Hold outlet temperatures to about 140 to 160 F. Install temperature controls to shut down engine if water gets overheated. Attach controls to cylinder heads, but if there's only one, locate on cylinder farthest from point where water enters engine.

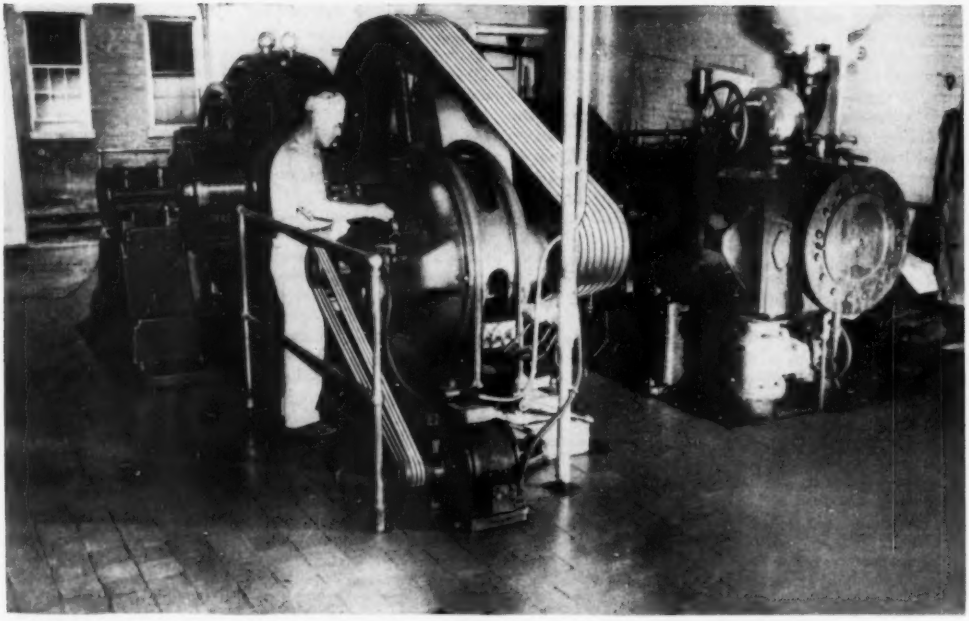
River water might test as suitable for engine cooling but water-hardness content often changes rapidly. This happens during rainstorms, especially if river serves a wide drainage area.

Details. Cooling-system piping should be of cast iron or galvanized steel. Rubber gaskets with cloth inserts work best. Gate valves offer less flow resistance than globe valves. All strainers must be twice cross-section area of pipe. Use only long-radius elbows and as few as possible. Flange-type fittings have less frictional loss than screw-type.

Don't convert just any old tank for your water tank. If outdoors, brace it to withstand 100-mph winds. If it is built locally, insist on cypress, redwood or cedar, but first consult local ordinances. They might specify steel only. Use centrifugal bronze-fitted single-stage pumps for best service.



6 Open cooling system where there is plenty of good water. Control temperature by returning hot water to pump suction



AC GENERATOR belted right off old flywheel located between steam engine and dc generator. V-belts lie directly on flat face of flywheel and connect to sheave on ac generator shaft. Setup has worked well over the years . . . with original belts

V-Belts Help Old Plants

Two cases point out the smart use of belting. One plant powered new generator from engine flywheel; another used dc motor-frame, belts, for transmission. Gates Rubber Co info

► YOU FELLOWS who operate old dc plants have a little problem on hand when you need ac to feed new equipment. Often only small amounts are wanted. This has come up many times in the past, especially in hospitals powered from their own dc engine-generators. When X-ray equipment is installed, standard 60-cycle ac is a must.

In many cases this power need has been met by installing small dc to ac rotary converters.

Where a heavy ac load called for it, a new ac service was often brought into the building. This feed, supplied by the local utility company, handled ac load only. Main load was still taken by the old dc generators.

Still a third solution was to install an ac generator right in the engine room. But this often meant supplying a new prime mover.

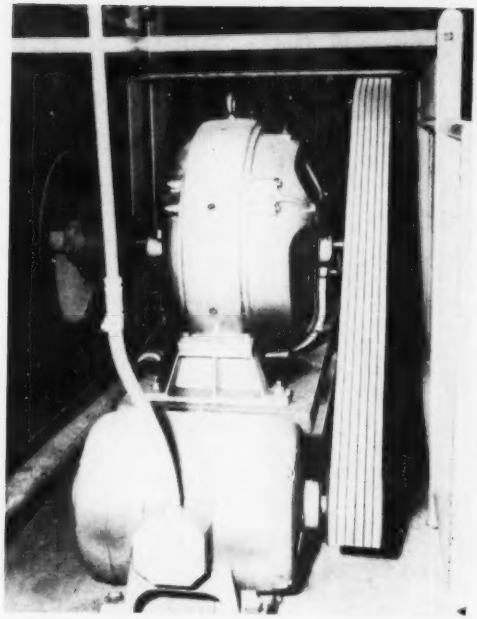
Both cases below point up the possibilities belts offer in solving troublesome mechanical drive problems. Ingenuity coupled with V-belt know-how can be used to get operating men out of many a tough spot.

CASE NO. 1 *The belted flywheel:* Some time back, Carl Powers, chief engineer of Indiana State Hospital, Evansville, faced just this problem. For many years steam engines and dc generators supplied all hospital power. The plant rolled along fine. Then new equipment had to be fed with ac. Of the above methods, the third was adopted—ac generators right in the old engine room.

The old engine had ample prime-mover power to handle the new units. Basic job was mechanical power transmission. Photo shows solution: Belting the new generators direct to engine flywheel. V-belts were laid right over flat face of engine flywheels connecting to sheaves on generator shafts.

V-belts also served to power exciters needed to supply dc to ac generators. Exciting generator was belted right off the free end of each ac generator shaft.

By belting new unit off the old engine, Chief Powers scratched talk of another prime mover. And little floor space was added since new generators and exciters were close to dc generators. How did this setup pan out? Well, after many years' service, same set of belts do topnotch job.



SINGLE BEARING FAN, originally dc powered, now belt driven by ac motor. New shaft extends through the old dc motor frame

Adopt Ac

CASE NO. 2 *Dc to ac:* V-belts figured in small way after changeover at Hutcheson High School, Kan. Belts pitched in on a heating, ventilating problem. Two 100-in. blowers move air throughout school. For years, dc motors drove these fans. Blowers were direct-connected to motor shafts. Fans had only single bearing. Through the coupling, motor bearings themselves supported outer end of each fan shaft.

Then the local utility dropped dc. How to drive these fans? Standard direct-connected ac motors appeared the practical out—that is, until slow-speed motor prices were checked. Next thought: belted drive connecting fans to standard ac motors. But fans had only one bearing. So for a belted drive, a new bearing, housing, support were needed.

Using the old dc motor's bearings and frame to support fan shafts neatly side-stepped the extra bearing problem. In place of dc motor armature, an extended straight shaft was put in. A grooved sheave mounted on outer end of new shaft. Fan shaft, new standard high-speed ac motor are connected with V-belts, photo. Multiple V-belts added insurance angle; if belt broke, fan operates till belt is replaced.

Looking broadly into this matter of changing from dc to ac, you may find it most practical to keep many of the old dc motors. Feed them through rectifiers from the new ac power supply. In this way the variable-speed feature of the dc motor is retained. Only addition is dry-type rectifiers.

Extending Machine Life With Flexible Couplings

► IF ANY TWO COUPLED SHAFTS could be maintained in perfect alignment, solid or rigid flange couplings would be quite suitable. But not only is perfect alignment tough to get first off, it's also practically impossible to maintain. Hence the need for flexible couplings.

Possible Damage. What would be the result of using rigid couplings where flexible units are called for? Well, misalignment of machines connected by rigid couplings not only causes excessive wear of bearings and machine parts but also increases power consumed. When two out-of-line shafts are connected rigidly, severe bending stresses are set up in each shaft. For each revolution, the shafts pass through a complete cycle of tension and compression stresses. If this condition were maintained, continued reversal of stresses would be likely to fatigue the shaft metal.

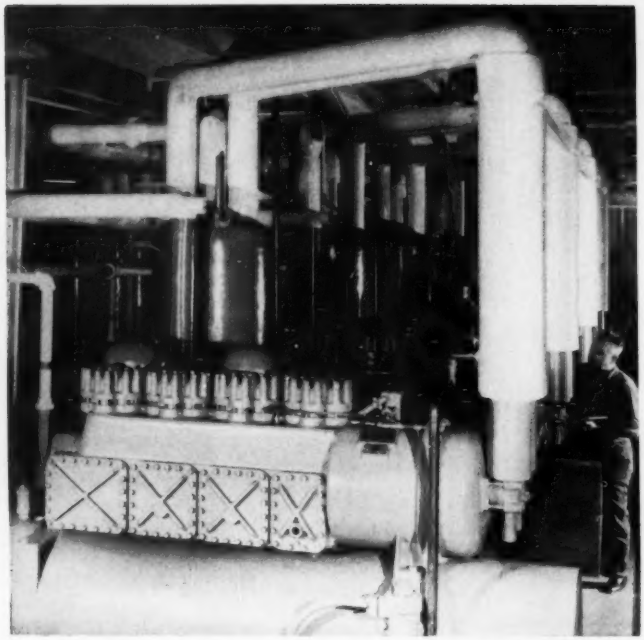
Another important point to keep in mind is the possible overheating and excessive wear of bearings. Then, too, for an electric drive, rigid couplings prevent motor rotor from drifting to its true magnetic center. It's possible under these conditions to cause heavy end thrust. Hence it was but natural that the flexible coupling was developed to handle conditions beyond limitations of its rigid counterpart.

Type Couplings. Fundamentally, there are but two ways of getting flexibility in a coupling. First, through use of a yielding element like rubber. Second, through mechanical design, providing for movement between rigid coupling parts.

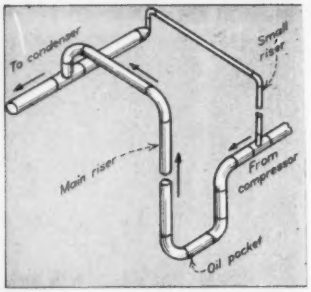
While many flexible couplings are manufactured that fall strictly in one or the other of these elementary classifications, others are available that combine both principles. In the yielding element type the flexible segment may be rubber, leather, a liquid-filled gland or flexible metal disks. Couplings that use mechanical design alone for flexibility may have a floating center, gear or chain as the working member.

At this point we want to stress that a flexible coupling should not be considered a cure-all for poor workmanship when machines are installed. Look upon it as a corrective for *unavoidable* misalignment. Machines connected by flexible couplings should be aligned as if rigid couplings were used. The purpose of a flexible coupling is not to act as a universal joint, or even to compensate for gross errors of alignment, as is frequently assumed. Align machines carefully when installing and then check this alignment at regular intervals.

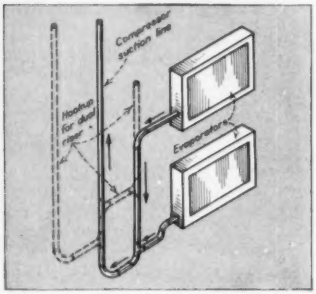
Look at flexible couplings as misalignment insurance —a provision to take care of errors in alignment that may develop *after* the machine has gone into service. If we put a machine into service that is out of line by 50% of the amount the flexible coupling can compensate for, then 50% of the investment in misalignment insurance has been lost before the machine turns over.



NEAT PIPING shows good planning to insure efficient running at all times. You can make your plant both attractive and efficient by working closely with manufacturer



1 Use double risers when gas velocity goes below 1500 fpm at low capacity



5 Loop suction line to form a seal for oil with evaporators below compressor

Eleven Piping Tips for Smart-Running Small Refrigeration Systems

Pipe your small refrigeration units right and you'll get top-notch year-round output. These pointers can save you time, money

► NOT ALL small compressor builders hook up their units the same way. But there are some setups many follow. Here are eleven for Freon and methyl chloride.

Hot-Gas Pipes. When compressor load changes much and condenser is high above compressor, double riser, Fig. 1, is good. At low load, oil collects in pocket, seals large riser. Gas passes through small riser at 1500 ft per min, the velocity needed to carry oil. At maximum load, gas flows through pocket, carries oil with it at 1500 ft per min.

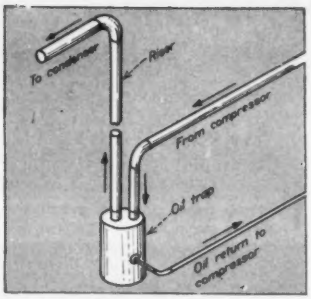
Oil trap, Fig. 2, does same job as double riser. Size riser for normal pressure drop at maximum load. Oil goes direct from trap to compressor.

Where condenser is above compressor and has a bottom inlet, loop hot-gas pipe so it forms a seal, Fig. 3. Have loop top six feet above condenser liquid level or connect vent line as in Fig. 3. Close vent valve after pumping down.

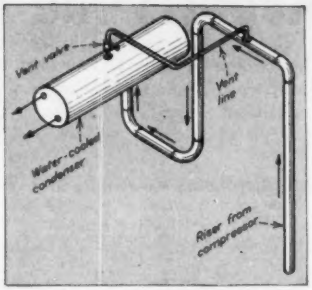
Suction Pipes. With two or more evaporators above or at same level as compressor, loop lower suction line, Fig. 4. This stops oil from top evaporator from collecting in lower while it is shut down.

With two or more evaporators below compressor, run suction pipe as solid lines in Fig. 5 show. When dual riser is needed, run as shown in dotted and solid lines of Fig. 5. Lower evaporator would then be above upper one shown.

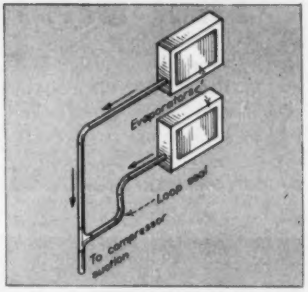
Expansion Valves. Some evaporators



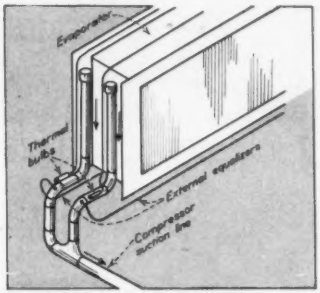
2 Oil trap may be used instead of a double riser. Trap returns the oil



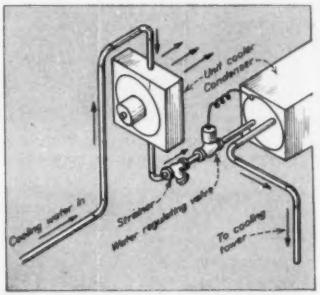
3 Loop hot-gas line before entering condenser. Vent cuts siphoning action



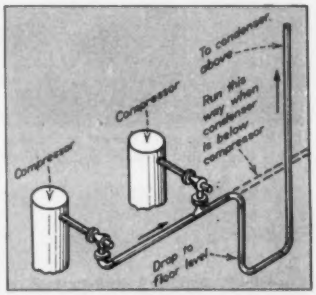
4 Connect suction line like this when evaporators are above the compressor



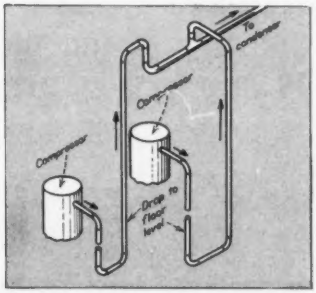
6 Use separate suction lines when the evaporator has two expansion valves



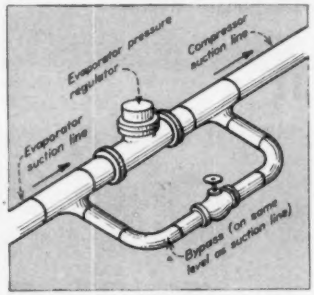
7 Cool the compressor room with a unit cooler hooked up as shown in sketch



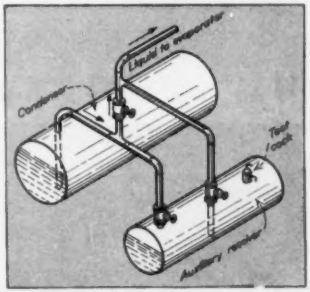
8 Compressors in parallel can use the horizontal discharge line shown here



9 Run loops to floor when compressors in parallel discharge to high main



10 Bypass on same level as evaporator pressure regulator saves you time



11 Auxiliary receiver holds pumped-down liquid; don't fill to the top

have two or more expansion valves. To stop one valve circuit from affecting the other, run separate suction lines, Fig. 6. Run each line several feet before connecting to common suction pipe.

Room Cooling. Where compressor room is hot or local code requires room ventilation, hookup in Fig. 7 is good. Cooling water on way to condenser passes through unit cooler fitted with fan that runs when compressor does.

Parallel Operation. When compressors are close together and they discharge to one condenser above them, run discharge line as in Fig. 8 if line can be close to floor. Where line can't be close to floor, run as in Fig. 9. Loop is used where condenser is above compressors.

Backpressure Regulator. One-valve bypass, Fig. 10, lets you work on vital parts of backpressure regulator without shutting system down. Have bypass line on same level as suction line.

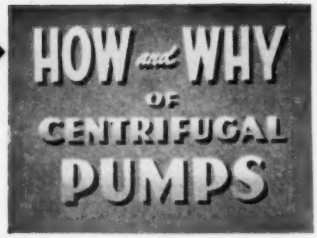
Receiver. Most small systems don't need a separate receiver, but where there's a large charge, a receiver is a big help. Hookup in Fig. 11 is good because receiver is valved off at all times except when system is pumped down.

Remember that hookups we've shown here are general. Maker of your compressor may prefer different ones for his unit. So be sure to check with him before changing your old piping or running new lines. Sketches are guides.

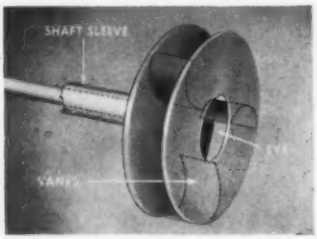
Film Brief Reports the ➧ HOW and WHY OF CENTRIFUGAL PUMPS

Here's the second of three Allis-Chalmers films on pumps. Our first, POWER, June, pp 120-123, covered maintenance. Here we show about half of a fine talkie on what makes a centrifugal pump move fluids. If you or engineering groups want to see all of this film, contact A-C

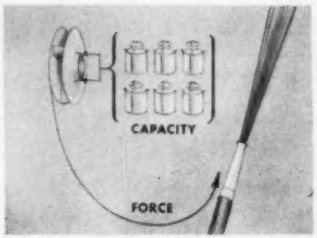
By **JOHN GAMMELL**, *Supervisor of Sales Training, Allis-Chalmers Manufacturing Co*



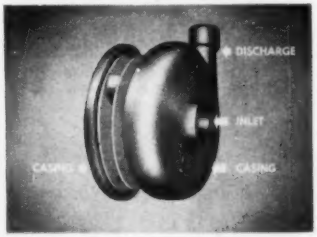
1 Farmer Brown starts our pump story, then a pump engineer takes it over



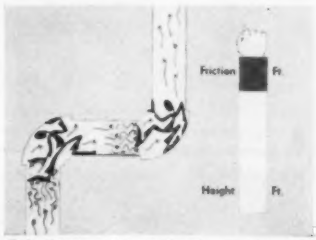
5 But in pump we call wheel an impeller. It has a shaft, vanes and inlet eye



6 Wheel throws liquid out. With large eye and high speed, gpm, psi are more



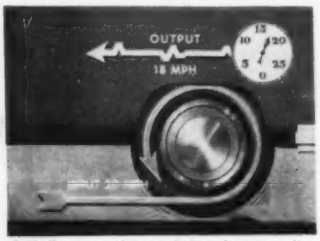
7 Casing encloses impeller, directs the flying liquid out the discharge pipe



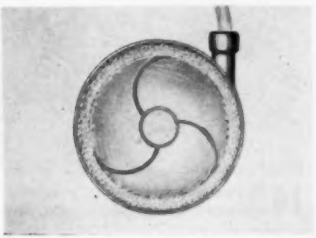
11 Friction head is pipe resistance, feet; add to static for total head

12 Farmer Brown and Betsy know the bigger the load the more hp it takes

13 Pumps are the same. The more gpm the bigger the pump with greater hp



17 Even on dry road there's some slip. Wheel never puts all hp in motion

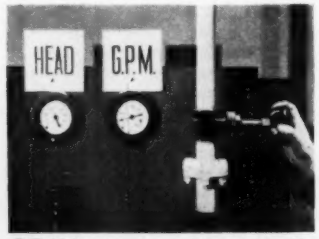


18 Impeller can slip, too. It churns the water and efficiency drops off

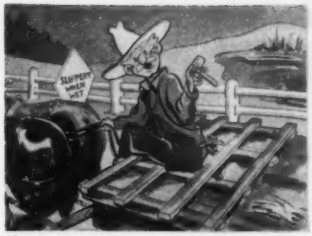
19 So you can see pump performance includes head, gpm, hp, efficiency

23 Since we can't see water going to upstairs tank we use this gpm gage

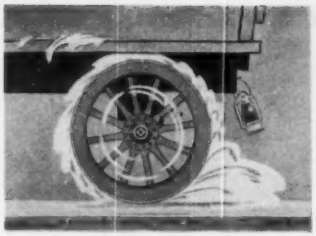
24 Head pump develops at any point is measured with gage reading in feet



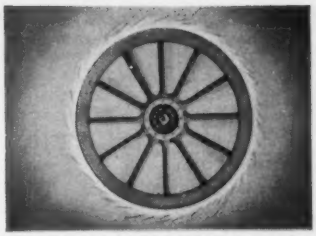
25 Valve to give resistance just like pipe in real system is near gages



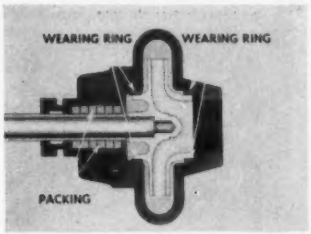
2 Ever walk close to a wagon a-goin' down a wet road? If you did you'd . . .



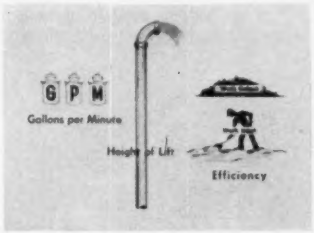
3 Get wet from water spray flying off the wheel. Centrifugal force makes...



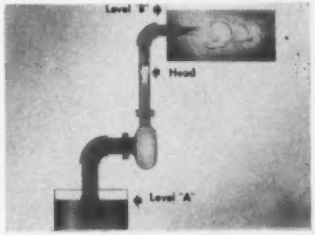
4 Water fly off the wheel. The wheel does same thing as wheel in pump



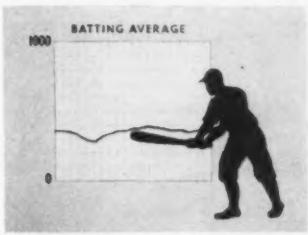
8 Shaft packing keeps air out of pump, water in. Wearing rings prevent leak



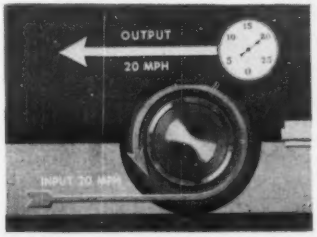
9 Pump performance is how many gpm handled, lift height and efficiency



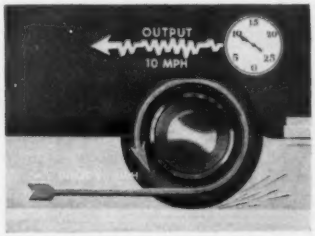
10 Static head is distance from level *A* to *B*, measured with a tape or rule



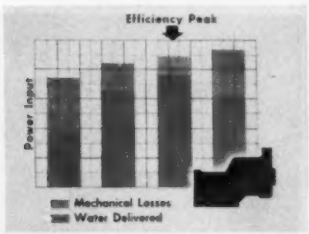
14 No ball player bats one thousand percent; no pump is 100% efficient



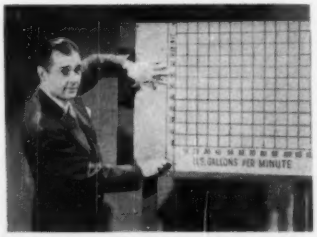
15 No machine has 100% efficiency as this car would if input = output



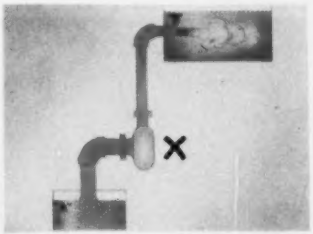
16 On slippery road drive wheel spins. Efficiency here is 10 ÷ 20, or 50%



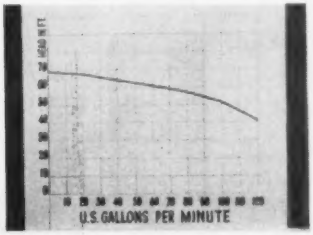
20 We can put them together in a bar chart but curves are much better



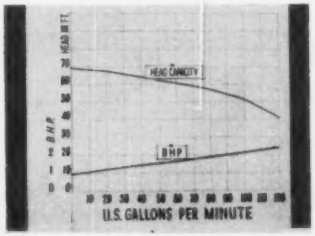
21 Here's the chart for pump curves. Head is vertical scale, gpm bottom



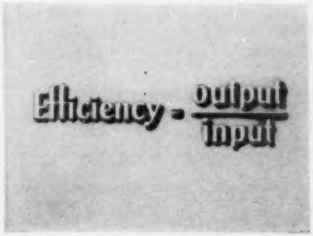
22 We'll run small single-suction pump and stand at *X* between tanks *A*, *B*



26 By opening valve slowly and marking gage readings we get head-gpm



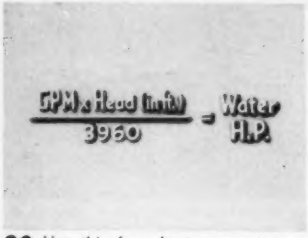
27 Measuring power input and plotting we get brake hp performance curve



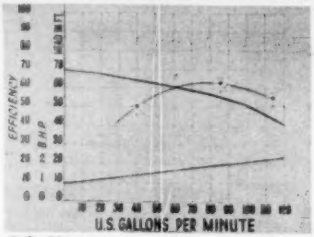
28 Pump, or any machine efficiency for that matter, is the output ÷ input

More on next page

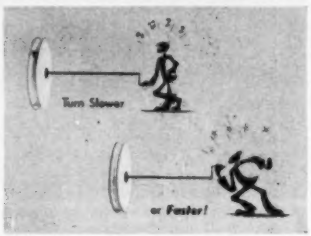
DON'T MISS THIS FILM! YOU'LL LEARN MORE ABOUT CENTRIFUGAL PUMPS IN A FEW MINUTES . . .



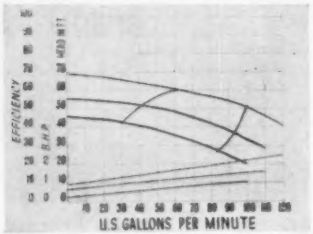
29 Use this formula to convert gpm, head to hp. It's pump's hp output



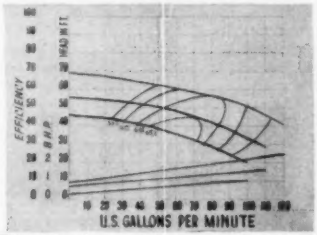
30 Efficiency-curve plot shows 85 gpm is best running point for this pump



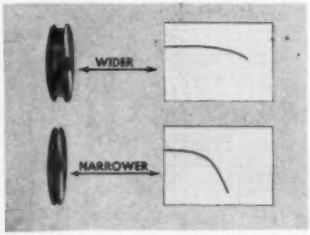
31 We alter pump performance curve by changing shaft rpm, impeller dia



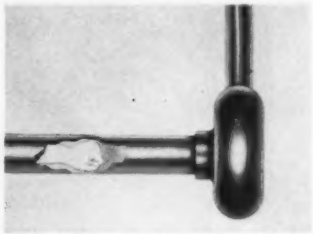
35 Connect points for "Oak Tree ring." Efficiency in area is 60% or better



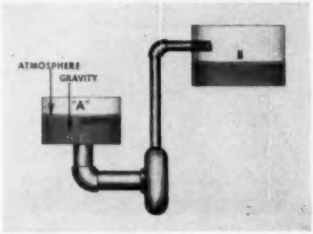
36 Here's completed curve for 60, 63 and 65% efficiency of these pumps



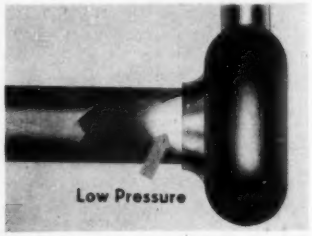
37 Besides changing dia we can also vary impeller width to alter curves



41 Water in suction pipe is pushed into pump by outside force that is . . .



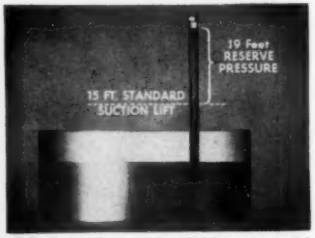
42 Gravity and atmospheric pressure if tank is above pump as is shown here



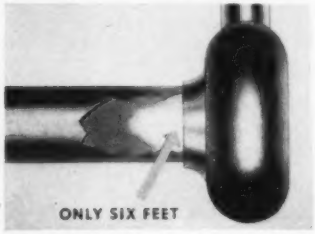
43 Impeller causes a partial vacuum at pump inlet. Water rushes into area

47 Atmospheric pressure pushes on water below pump inlet, raises . . .

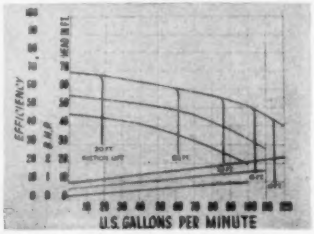
48 Water at most 34 ft. But friction, leakage and losses prevent this lift



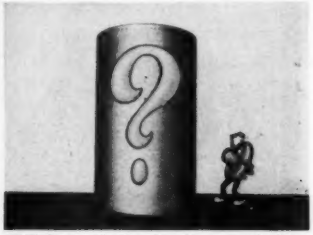
49 So makers set a 15-ft suction lift as standard for centrifugal pumps



53 Capacity because pressure at inlet can be reduced only to 5 ft or . . .

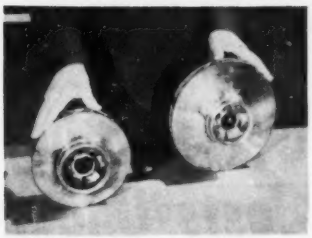


54 Breakoff point will be reached as here. Pump won't deliver any more

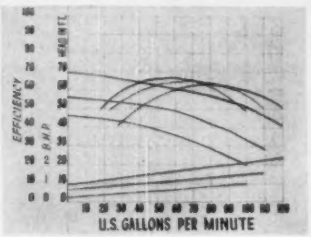


55 Pump design, its size, speed, shape of impeller are directly related . . .

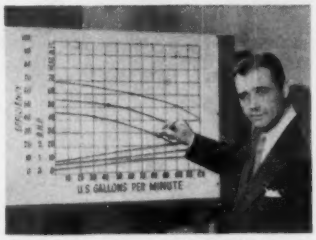
. . . THAN YOU EVER EXPECTED. IT PUTS TOUGH IDEAS INTO CLEAR, EASY-TO-REMEMBER PICTURES



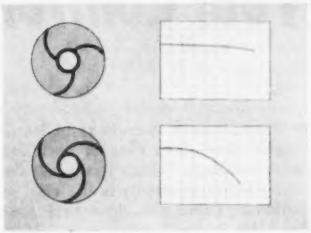
32 Here are two different sizes of impeller for which we'll plot curves



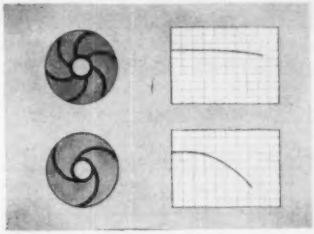
33 Here are curves for same pump with three different sizes of impellers



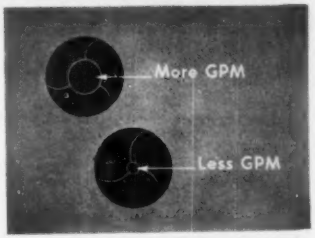
34 Dots here mark where efficiency is 60% or better for each of the pumps



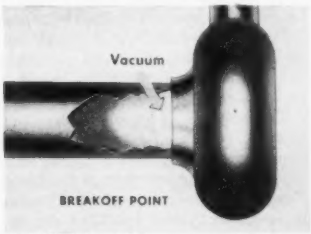
38 Changing vane pitch also affects performance, as these curves show



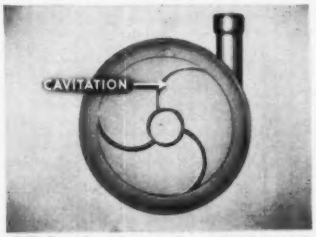
39 Impeller with more vanes gives flatter curve. Few vanes steepen curve



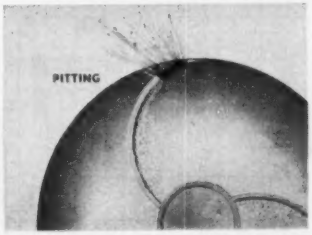
40 Big inlet eye allows pump to handle more fluid than the small eye does



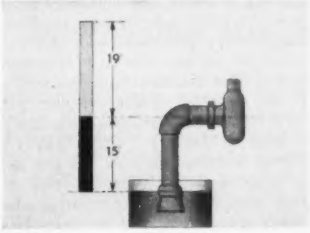
44 With low inlet pressure and high vacuum, the water may flash into steam



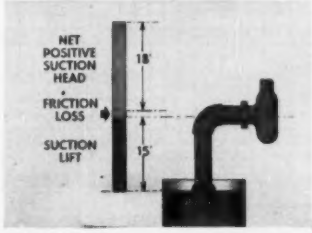
45 Bubbles of vapor formed with a high vacuum may move along vane to . . .



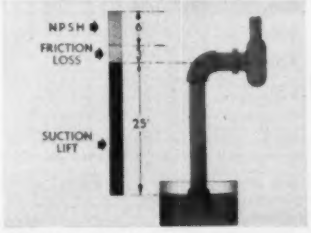
46 High-pressure area where bubbles break. Water hits vane, digs pit



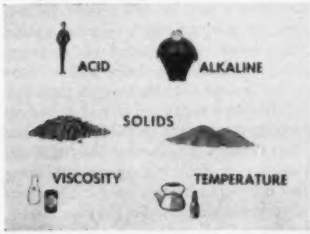
50 Margin of 19 ft is left to overcome friction and to push water to pump



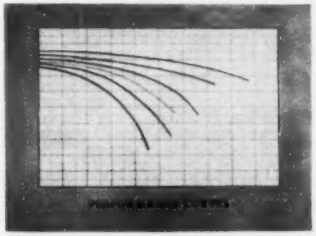
51 In pump shown here suction lift is 15 ft, friction 1 ft, npsh is 18 ft



52 With 25-ft lift, friction becomes 3 ft, npsh drops to 6 ft, cutting . . .



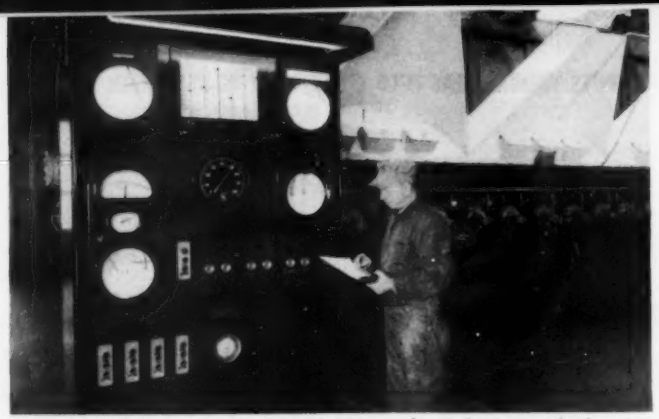
56 To fluid pumped, acid or alkaline, and to the distance fluid is lifted



57 But in any case performance curves are your key to the proper selection

58 As Farmer Brown says, "If you ever rig a pump to pitch hay, call me."

Film produced by Atlas Film Corp



CLOSE ATTENTION to operating details, holding overfire draft at proper level, seeing that fuel supply is even, goes a long way toward keeping your heating costs down

Get Heating Costs Under Your Control

For normal conditions turn heat on and off at:

BUILDING *SAMPLE* MONTH OF *NOV.* 19 *51*

On	Off	Steam or fuel allowance Pounds*	Mean temp °F
3.50	5.45	183251	-6
		180670	-5
4.00		178089	-4
		175508	-3
		82292	33
6.40		80011	34
		77430	35
6.45		74849	36
		72268	37
6.55		69687	38
		67106	39
7.05	4.00	64525	40
		61944	41
7.15		59363	42
		56782	43
7.25		54201	44
		51620	45
7.30		49039	46
		46458	47
7.40		43877	48
		41296	49
7.50	3.30	38715	50
		36134	51
7.55		33553	52
		30972	53
8.05		28391	54
		25810	55
8.10		23229	56
		20648	57
8.20		18067	58
		15486	59
8.30		12905	60
		10324	61
		7743	62
		5162	63
		2581	64
		0	65

Contents of building *4,303,000* Cu ft Degree-days this month *725*

Note: After Sundays and Holidays turn steam on ___/___ hr earlier than above	Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Day of Week					S							S							S			H			S					
	Steam turned on at	6.40	6.25	6.45	6.40	9.00	6.15	7.25	6.40	7.25	7.05	6.30	9.00	6.15	7.30	7.40	7.50	7.55	7.25	8.30	6.15	6.50	6.45	9.00	6.15	6.45	9.00	6.00	6.40	6.40	7.00	
	Steam turned off at	4.00	4.15	4.15	4.00	11.30A	3.45	3.45	4.10	4.00	3.45	4.00	12.00N	4.00	3.30	3.40	3.00	3.00	2.00	12.00	4.10	3.45	3.50	12.00	4.00	4.00	12.00	4.00	4.00	3.45	3.30	

Note: This chart based on *.6* lb steam per degree-day per 1000 cu ft of building volume.
* or _____ fuel

A.M. in red
P.M. in black

Below normal

Above normal

STEAM RECORD
Total pounds of heating steam consumed *4,573,653*
Pounds of steam per degree-day *2130*
Pounds of steam per degree-day per 1000 cu ft of building volume . *.504*

FUEL RECORD
Total _____ of fuel consumed
_____ of fuel per degree-day
_____ of fuel per degree-day per 1000 cu ft of building volume
* (Insert unit which corresponds to fuel used, i.e. pounds, gallons, therms, or cubic feet)

DEGREE-DAY SYSTEM for scheduling on-off operation of your heating plant saves you an estimated 22% in fuel, and it permits you to compare plant performances

► BUILDING HEATING ranks as the fourth largest item of expense in operating office buildings. What's more, it is the major basement activity in this class of building. Labor costs here have gone up 137% in the last few years. More and more automatic controls are going in to meet these rising costs. In a setting like this you can see you're asking for trouble if you let heat losses get out of hand. In fact, it's smart operation to ready yourself for questions on plant performances, costs.

Toughest job in supplying building heating is setting up some quick and easy way of getting heating costs in line. There are a number of ways to reduce these losses, including close attention to operation, photo, left. But the answers management wants are day-to-day checks on how your plant is performing against what's considered good practice. Latest figures on average heating costs (office buildings) indicate about 10c per year per cu ft of heated space. (But building managers feel a 25-30c operating charge per year per cu ft of air-conditioned space is in line.)

Back in January 1952, p 116-117, POWER described the tried and true degree-day method of keeping track of fuel consumption and comparing one year's operation against the next. National Assn of Building Owners and Managers, Chicago, Ill., has carried this idea a step or two further by setting up a steam or fuel consumption chart based on degree days, diagram, left. It permits an hour-to-hour, day-to-day record. Then they've tied this record into a suggested way of operating your heating plant to hold costs down. They claim a 22% saving for buildings running on their system against those just supplying heating needs. The operation is simple enough. They have set it up for manual operation, although it is possible to work in various control aids.

• Establishing Degree Days

From 65 F subtract the mean temperature of the day. The mean is found by adding lowest and highest temperatures during the 24-hr period, dividing the sum by 2. Difference between mean temperature and 65 F is number of degree days. If the mean is above 65, answer is zero degree days. (NOTE: An "industrial" degree day is figured from 45 or 55 F.) Example: Day's high 55 F, low 35 F. Mean temperature $(55 + 35) \div 2 = 45$ F. Degree days $65 - 45 = 20$

• Setting Steam or Fuel Allowance

Column 3 of diagram, facing page, comes close to facts if you take the total figures of steam produced (or fuel if you want) from a previous heating season and divide them by the total degree days of that season. This last you can get from the local Weather Bureau Station. The answer is total steam (or fuel) your plant takes to meet one degree day. This figure (2581 here) goes in column 3 opposite the 64 F point. For two degree days multiply by 2 and set next to 63 and so on, to the lowest temperature likely to occur in your area, −6 F, say, as in the diagram.

When you have no previous steam or fuel totals that are reliable you can make an estimate on "heating allowance" by using 0.1 lb of coal, 0.008 gal of oil, 1.1 cu ft of natural gas, and 2.0 cu ft of manufactured gas, or 0.6 lb of steam per degree day per 1000 cu ft. But the weakness of these figures is that they are based on a 100% boiler efficiency, with a 10% loss allowed for piping, etc. You must recognize, and so must the plant owner, too, that your boiler efficiency is probably nearer 60-70%. The result is that your steam consumption figure will be more than these estimates. How much more than these estimates will depend on the efficiency of your boiler. You can run checks on this yourself.

Where you generate appreciable amounts of hot water from the same fuel or the boiler output, deduct its cost to you in the steam consumption or the fuel burned from your previous heating season records.

• Putting System to Work

In the first two columns of diagram, facing page, you'll find an ON time and an OFF time. When you set your heating system in operation for the first time, observe the outside temperature, say it is 55 F, and turn on the heating plant at the time recommended in the first column for a mean temperature of 55 F, 8:05 am. Now if the day's temperature stays at 55 F (not at all likely), its mean temperature will be 55 F, and the recommended shutdown time is 3:30 pm.

But suppose outside temperature goes to 65 F (much more likely) your building thermostat controls should turn the heating plant off. If not, you'd shut the plant down yourself. If outside temperature went to 60 F, recommended shutdown time for that temperature, column 2, would be 3:30 pm.

In any event while you are building up experience with this method, consult the recommended shutoff times of column 2 against the outside temperature as the day progresses. Follow the recommendations and you may be able to shut down your plant early.

• Determining Minimum Temperature

The ON and OFF times in the chart, facing page, refer to normal heating steam demands. But throughout it all, remember that there is a definite minimum temperature to which you can let building temperature drop even after "hours." Learn your building characteristics.

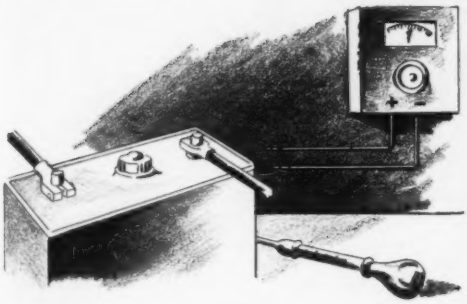
The absolute minimum, of course, is a temperature point that is enough above freezing to prevent damage to piping, etc. The most likely is a point (usually above this minimum) which insures that you can raise the building temperature to the comfort zone by the time occupants arrive. This desired low point depends on your particular building, its insulation qualities, the rate of heat loss, etc.

• Checking Results

Once you've got your boiler room running according to the suggested schedules for the different temperatures that are shown on the diagram, observe whether heating has been adequate. If so, start your system up a little later than recommended and shut it down a little earlier, maybe 10 minutes or so. If heat was inadequate, do just the opposite. Across the bottom of the diagram you'll see a tally of actual ON and OFF times adjusted to meet a particular building's experiences.

You can keep a daily record of difference between heat allowance and fuel or steam actually used. From your records get the fuel or steam consumed for the previous 24 hours. Then get mean temperature for same period from Weather Bureau. Figure in the 3rd column of diagram, opposite this mean temperature reading, is your heat allowance for the day. Fill in vertical space from that point up or down to the total your records show. If you used more than you allowed, write with red ink, if less, blue. Thus you have a ready check on how you are doing.

Suppose you run consistently in the red. Check over your system carefully. If it's doing all you can expect of it, correct your heat allowance figures to show the facts. If you run consistently in the blue, you will have to revise the allowance figures down. But you'll know where you stand.



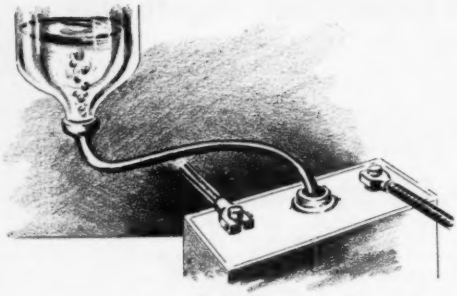
1 Charging Methods

Float method of charging is used with most glass-jar batteries. It means maintaining an average charging voltage of 2.15 v per cell at battery terminals.

Periodic method calls for normal "finishing rate" (as specified by battery manufacturer) as charge rate. But use charge rate equal to 8-hr discharge rate if battery is 25% discharged. Then when cell voltage exceeds 2.3, reduce charging rate to normal finishing rate. Stop charge when specific gravity is 10 points below maximum.

Equalizing charge should be given every 3 months. Use a total charging voltage of 2.33 times number of cells in battery. For example, total charge voltage would be 60 × 2.33 or 140 v for 60-cell battery. Continue equalizing charge till there is no increase in specific gravity of pilot cell for 24-hr period *after current to battery has tapered to constant value*. Record voltage and specific gravity of all cells at end of charge.

Emergency charge should follow any emergency discharge. Charge battery at any current value in amperes not greater than 1½ times the 8-hr discharge rate. When gassing starts, reduce current to finishing rate and continue till voltage and specific gravity remain constant.



2 Adding Water

As a rule stationary batteries don't need water more than twice a year . . . may even extend to a year before electrolyte level drops to low-level mark. Maintaining level of electrolyte is simplest phase of battery maintenance. Don't overlook it. Here are a few tips.

Select one cell as a pilot cell. Any cell except charge-indicator cell will do. Add water so solution is just at level line. Best practice calls for adding water just before an equalizing charge. It will then mix with the electrolyte during charge. Never allow electrolyte-level to drop below low-level mark. And, on the other hand, never fill cells above the high-level mark.

Use approved water in all batteries. Distilled water is approved but local water is often OK. To be sure send water samples to battery manufacturer for analysis. Water loss varies with amount of charge and discharge.

Store water in a glass, plastic or rubber container. If possible, have water container elevated and movable. Fit container with hose and nozzle to make watering fast, easy. Keep record of date, amount of water added.

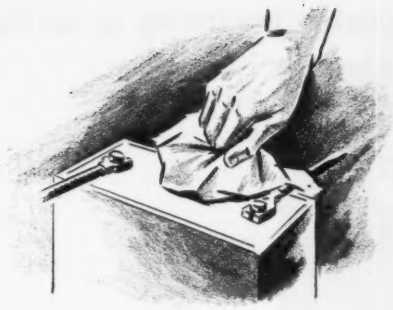
Never add so-called special battery solutions, powders, jellies. Most of these harm the battery.

5 Sound Tips For Stretching Battery Life

CHECK-LIST FOR STATIONARY BATTERIES IN NORMAL SERVICE

OPERATION	EVERY DAY	EVERY MONTH	EVERY 3 MONTHS	EVERY 6 MONTHS
INSPECT BATTERY TERMINALS AND CONNECTORS				✓
CHECK ELECTROLYTE LEVEL		✓		
CHECK AND RECORD FLOATING VOLTAGE OF BATTERY	✓			
CHECK AND RECORD FLOATING VOLTAGE AND SPECIFIC GRAVITY	PILOT CELL		ALL CELLS	
GIVE EQUALIZING CHARGE			✓	
CLEAN BATTERY				✓
CHECK CHARGING EQUIPMENT		✓		
GIVE IDLE BATTERIES FINISHING CHARGE			✓ or when the specific gravity drops to 1.200	

Information From Gould-National Batteries, Inc, Trenton, N. J.



3 Cleaning Cells

Clean batteries prevent current leakage across terminals and possibly to ground. Wet or dirty battery tops offer good current-leakage paths. Cleaning is a simple job when you follow the plan outlined below.

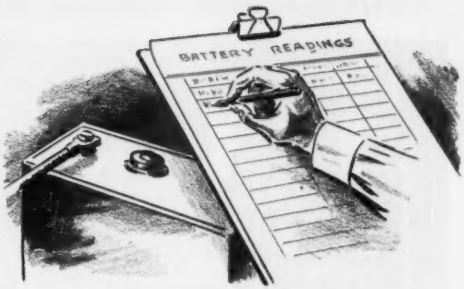
First step is checking that all vent plugs are in place and tight. If battery tops are wet from gassing or spilled electrolyte, neutralize with a concentrated solution of soda and water.

Cell terminals and inter-cell connectors may be cleaned with a wire brush. Clean lead-plated copper connectors with No. 00 sandpaper or a suede brush.

Never scrape connectors. Scraping can damage the lead plating of copper connectors. Removing the protective lead covering exposes the copper beneath to corrosion.

Wash top of battery with plain water. Then wipe dry with a clean cloth. After thorough drying, coat terminal surfaces with battery grease or vaseline.

Modern glass-jar cells have a vent plug with a built-in condensing chamber. This chamber traps any acid spray and funnels it back into the cell while at same time letting the gas trickle out through the vent openings. Only hydrogen and oxygen escape from the battery.



4 Keeping Records

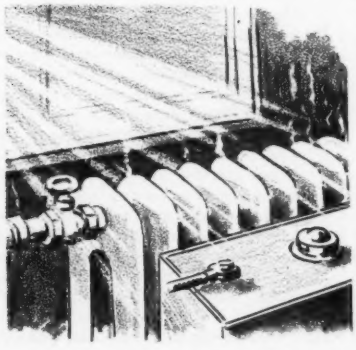
Accurate records tell you (1) whether batteries are fully charged when placed in service (2) number of months each battery has been in service (3) which cells often need equalizing charges (4) whether batteries are being properly charged (5) when battery needs replacing. Here are the highlights of a simple record system.

Number each cell to speed identifying. When the battery is installed, record specific gravity and temperature on record chart. Also note the date each battery is put in service. Use prepared numerals fastened to battery rack to keep track of cells.

Specific gravity, temperature and charging rate should be recorded along with the date, whenever an equalizing charge is put on. Note the battery floating voltage at least twice daily. Record the floating voltage and specific gravity of pilot cell every day. The floating voltage and the specific gravity of all cells should be checked and recorded monthly.

Water added should be logged, both amount and date. Review all the readings from time to time and compare them with the previous data to spot any irregularities. Excess water consumption is one sign of overcharging.

5 Proper Installation of Batteries



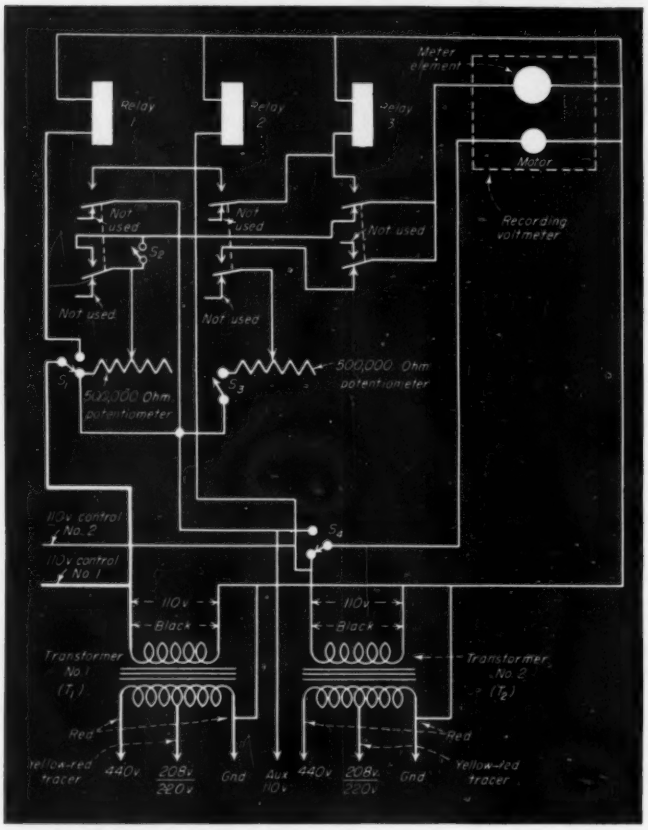
There are a few simple precautions in locating, installing and connecting batteries for full-float service that will go a far way in making your job easier.

Hot locations speed up self-discharge of battery, which means shorter battery life. So keep batteries out of direct sunlight, and away from steam pipes, radiators and similar heat-generating equipment. Ample ventilation in battery room is a must to carry off battery gases. Louvers at top and bottom of door panels usually do the trick.

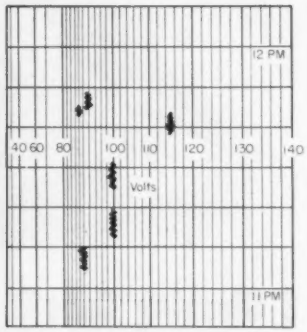
Install batteries on racks at suitable height. This will simplify adding water and taking hydrometer readings. Coat racks with acid-resistant paint. Make them plumb and level and insulated from the floor. When two or more racks are used they should be insulated from one another.

Clean contact surfaces when installing batteries. Then apply a thin coat of vaseline. Use a cord for a straightedge in lining up cells. When they are right-in-line, put on your inter-cell connectors. Start this cell-connecting job at center of battery. Connect positive to negative tightly. Check polarity of all cells. See that electrolyte level is right.

Recording-voltmeter attachment permits checking two sources on one chart



TWO MACHINE OPERATIONS are recorded by varying voltage with each potentiometer. Each source will leave marks at different voltage levels (see chart to right)



PUMP OPERATIONS shown by: 90 v for No. 1; 100 v, No. 2; 115 v with both on

Getting More Use From Recording Voltmeters

This recorder-attachment lets you (1) handle up to 500 v (2) use voltmeter as recording timer to check machine operations (3) record two sources at same time with one instrument

By L W FITZPATRICK, *Chief Engineer*
Dept of Correction, Jefferson City, Mo.

► IN ALL TOO MANY PLANTS recording voltmeters gather dust until voltage trouble calls them to work. With this plant-made relay rig you can get more use from your instrument. Device extends voltmeter range to about 500 v. It lets you tell just when a machine starts and stops. But the big advantage is that you can keep track of operations on two different circuits simultaneously. Typical would be the recording sequence of two water pumps connected to cycle automatically, switching from one pump to the other to equalize wear.

Building the Rig. Here's what you need to build the "extender": two single-pole double-throw toggle switches, two single-pole single-throw toggle switches, two stepdown transformers, three 110-v double-pole double-throw relays and two 500,000 ohm potentiometers. Fit the assembly into a carrying case.

For higher voltages the rig serves as a stepdown transformer unit. Here you connect input line to proper input terminal on either transformer T_1 or T_2. Close switch S_1 so current flows through one 500,000-ohm potentiometer. Then close switch S_2 connecting recording element in series with potentiometer. If necessary use potentiometer to adjust voltage across recording element. Energize the recorder motor through the switch S_4.

You can also use voltmeter as a recording timer—showing when equipment-motor starts and stops. Here's the hookup. Connect lead from ahead of motor starter to proper terminal on transformer T_2. Close switch S_1 and S_2 letting current flow to recording equipment.

By resetting pointer on chart with po-

tentiometer you can select different voltages; 90, 95, 100, 105, 110. This allows reusing the charts with different voltage settings.

Dual Timer. We certainly don't need all the switches and relays shown in sketch to handle the relatively simple jobs outlined above. This equipment comes to the foreground where you want to keep track of two independent voltage sources. Here's the setup.

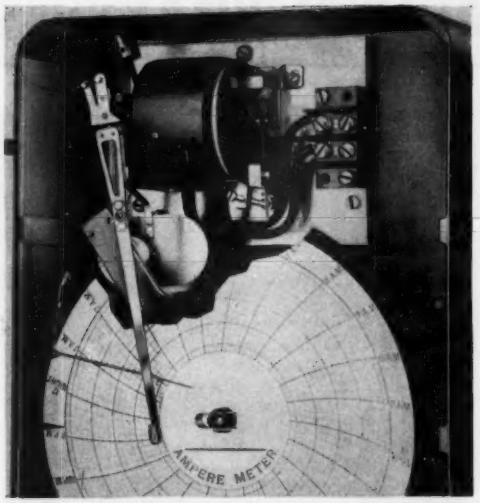
First, connect an independent source of 110 v to auxiliary 110-v tap. Close switch S_4 so current flows constantly to recorder motor. Next, consider the two pieces of equipment for which you want a running check. Handle these by first connecting a lead from load side of one motor starter to proper voltage tap on transformer T_1. Close S_3, letting current flow to potentiometers and through relay No. 1. Leave S_2 open.

Then connect from load side of second equipment to proper voltage tap on transformer T_2. Adjust voltage on potentiometer No. 1 to 90 v. Adjust voltage on potentiometer No. 2 to 100 v.

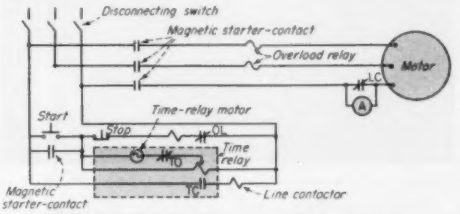
When input to T_1 is alive, relay No. 1 will close, putting a *90-v reading* on chart. If T_1 is not energized, but T_2 is, relay No. 2 closes, putting a *100-v reading* on chart. And if both T_1 and T_2 are energized, relay No. 3 comes into the picture. This relay is so interlocked that it closes if both transformer primaries are energized. And when relay 3 closes it puts a *reading of 110 to 115 v* on chart depending on line voltage.

Application. The section of chart shown drives home the dual-timer feature. Here two water pumps are connected to automatic cycling controls. Let's look at the record: Both units were off at 11:00 pm. At 11:05, pump No. 1 (90 v) operated for 5 min. At 11:10, both pumps were off. At 11:15, the controller cycled to pump 2, as it should. Both pumps were off at 11:20. Then instead of recycling to pump 1, pump 2 started out of sequence at 11:25. Both pumps were off at 11:31. At 11:38, both pumps (115 v) were on the line and stayed there until 11:43 pm. Correct cycling started at 11:45 when pump 1 (90 v) came on and operated till 11:49. Charts clearly show defect.

The same setup can be used to analyze elevator-car travel. It tells which operator takes most traffic and exactly when both cars are needed. We've found it possible with the elevator data on hand to reschedule elevator operations, saving more than 14 operator-hours per week. Other applications include checking refrigeration controls, timing the filling and emptying of storage tanks, draft and combustion-control ratios, adjusting heating-system thermostats.



RECORDING AMMETER taps off current-transformer on ac circuit, and to shunt on dc system, to avoid normal heavy current



TIME RELAY shorts recording ammeter as motor is starting to protect instrument against burnout. Relay opens after 1 min

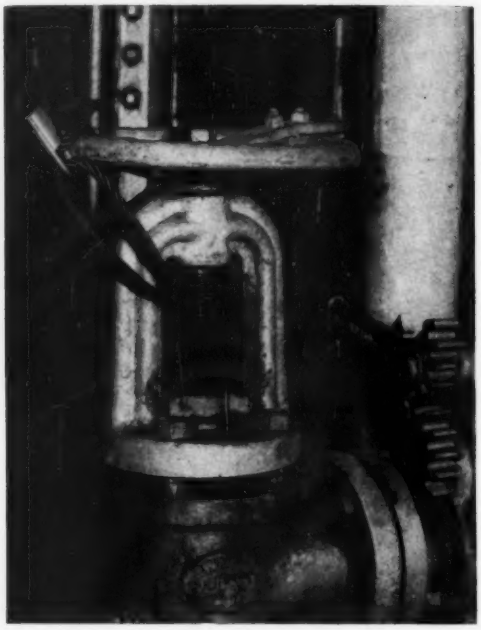
Relay Protects Ammeter From Motor-Start Currents

► KEEP HEAVY MOTOR-STARTING CURRENTS well in mind when installing an ammeter in a motor circuit. Usually a shorting switch across the ammeter prevents these currents damaging the instrument. Then after motor is up to speed, switch is opened to get a current reading. But what if you want to use a recording ammeter? It isn't practical to have a man right there to open and close the ammeter shorting switch every time motor starts. And if you select a scale large enough to handle heavy motor-starting currents, you'll be working on a low part of the scale once motor gets up to speed. Then any changes may go unnoticed. What's the answer?

I've found the time-delay relay outlined above does the trick. Here the ammeter connects into one of the motor lines as usual. But a normally closed contact from the time-delay relay is used instead of a shorting switch. Full-scale on recording ammeter is but slightly greater than full-load motor current. When motor starts, ammeter element is shorted out, and hence can't be damaged. Time-delay relay starts with main motor. We have the relay time-delay set for about 1 min. By then, motor current should be about normal. Relay then opens its ammeter-shorting contact, giving a reading on the chart.

SERGIO MARTINEZ, *Nicaro, Oriente, Cuba*

PRACTICAL IDEAS...*here's the trading post for your*



Lock That Blowdown Valve!

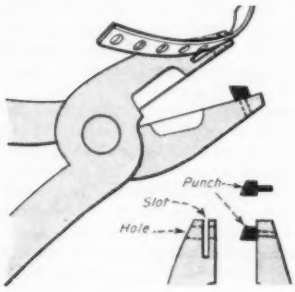
DO YOU ALWAYS LOCK the blowoff valve when boiler is down for cleaning or overhaul and men are working in the drums? If not, sooner or later some guy will scald men working in boiler by opening blowoff valve on live boiler.

Photo shows wire cable with lock. This valve can't be opened without a key. And if responsible person is in charge of key even dumbest knucklehead won't have chance to hurt anyone.

If you don't have one of these rigs, better get it now. It's mighty cheap insurance for your men.

BILL DAVIS
National Safety Council, Chicago, Ill.

EDITOR'S NOTE: *If you want to be* REALLY *foolproof destroy all the keys but one. Give that one key to Charlie when he goes into the drum. Figure that one out? Nuf ced.*



Pliers Make Hand Punch

A RECENT PROJECT required punching some brass shim-stock with a series of ¼ in. holes. Job had to be done without distorting shim-stock's original flat surface.

Using a pair of large linemen's pliers, we made an excellent punch in less than an hour. First we drilled a ⅛ in. hole through both plier jaws as shown.

Punch (die) was made from drill rod. Depth of punch was passed completely through slot. Punch was hardened by heating in a gas torch and quenching in water. We made stem oversize and press-fitted into place, although it could have been sweated in with soft solder.

We sawed a slot in opposite jaw with a jeweler's hacksaw. Then drilled a hole (exact size of punch) through slotted jaw. Slight burrs present were removed with die-sinker's files.

R F CLOTHIER *Auburn, Ala.*

Steam Jets Cut Smoke, Raise Boiler Output

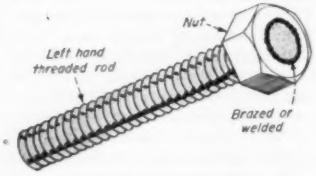
WE HAVE a 2500-sq-ft stoker-fired hrt boiler. Also a smaller hand-fired hrt, using forced draft. Our winter load is 15,000 lbs per hour.

I run the big boiler normally, the small one in emergencies. When heating load is off, we run small boiler while overhauling stoker on larger boiler. The load then is about 5,000 to 6,000 lb per hour. But we always had trouble with smoke when running the small boiler at that load.

Last winter I installed four steam jets across the front of this boiler. Total cost in fittings was $5.00. For the past few weeks now we have been steaming high as 7,000 lb per hour for 5 hours at a time—and no smoke.

This has saved us money besides, because we can now overhaul the stoker on our large boiler during regular hours without paying for overtime.

G MARSTON *Boston, Mass.*



Special Purpose Bolts

SPECIAL-PURPOSE BOLTS and cap screws, of unusual length or threads, can easily be made as shown. Proper size and length of rod is first threaded as required. Then screw a nut flush on one end of the threaded rod and braze the nut and rod, or weld solid.

T TRAIL *Catonsville, Md.*

operating and maintenance short cuts

STEVE ELONKA, *Associate Editor*

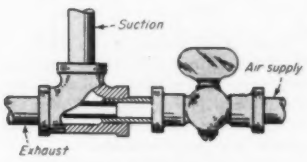
Plug Helps Clear Reference Line

WHENEVER WE HAVE a boiler down for repair, we also check the reference lines on our Hardinge ball mill. As every operator of this mill knows, the open ends of these pipes are about 1-in. diameter. They become a catch-all for medium-sized pieces of coal. Then lines get clogged, making them useless for determining the coal level within the mill.

To clean the line, air pressure is put on, which sometimes does the trick. But most of the time a man has to go into the mill and poke a wire through each of the many 1/16-in. holes. With air pressure on during this operation, he wears goggles. Finally the builtup coal within the pipe is cleared away by the compressed air.

I solved that headache by burning out the solid end of this so-called "magic pipe," tapped it with pipe threads and screwed in a pipe plug, sketch. Now when the line gets plugged, we remove the plug and push a heavy brush or piece of rod into it, clearing away the coal dust. This plug is a timesaver.

G J TROSKE *Midland, Mich.*

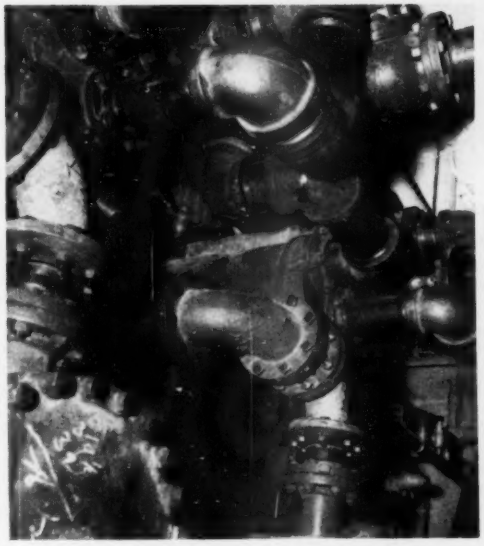


Homemade Aspirator

WE NEEDED A WAY to produce a variable partial vacuum at our plant. I made an aspirator out of ⅛-in. pipe and fittings. Air nozzle is a piece of ¼-in. copper tubing soldered to a ⅛-in. pipe nipple as shown.

We have used the aspirator to draw CO_2 samples, provide a variable vacuum for gage testing, speed up filtering solutions in the lab, etc. A steady vacuum anywhere from an inch to well over 20 inches of mercury can be obtained by varying air pressure.

J C TORREANO *Ishpeming, Mich.*



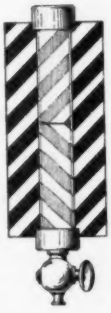
Pipe Fitting in Close Quarters

THIS IS NOT a Bill Eddy piping cartoon —it only looks that way. But photo shows how an excellent piping job looks, even though space to work in is tight and fittings close.

Water connections to condensers above and chilled-water connections to chillers below brought on a few problems. When fittings are short and the space limited, everything must fit and line up, or much time is wasted.

After years of pipefitting, I've found that high-class mechanics are worth their weight in gold to a contractor. Each fitting here lines up. There won't be any strain on piping, causing metal fatigue if there's vibration. If a short nipple doesn't fit exactly, my orders are to use a new one that will. After this job is lagged, it will give the service it was built for. That saves in repairs.

MIKE BRANNIGAN *Kansas City, Mo.*



Water Level Finder

WATER COLUMN gage glasses are hard to read from a distance, especially if glass tube is clean, water clear. Sketch shows attachment to solve this problem.

Paint black and white angles on a small sheet of paper or cardboard. Then attach in back of glass. Water level stands out as in sketch.

Amount of stripe distortion through water filled tube section depends on tube size and distance from tube to card. A little experimenting soon shows best stripe width and distance from glass.

L KASPER *Philadelphia, Pa.*

(*More on next page*)

More PRACTICAL IDEAS

Begins on page 124

Welding Saves Fire-Damaged Turbine

INTENSE HEAT of a bad fire cracked several turbine and generator housings. Weld-repairs of large castings were not tried in past, for fear of creating high residual stresses in casting. Instead, damaged housings were replaced, which often shut down plants for long periods.

We learned that these repairs can now be done "cold," with a patented new low-watt-input electrode. This permitted plant to return to full-speed operation within a few days.

First we ground all cracks out to a vee, of 75-90 deg. We drilled crack ends to prevent spreading. We then degreased weld area with carbon tetrachloride. Using an excess-oxygen flame, weld area was next "seared" to remove excess wire brushings. Since work had to be done "in position" no preheating in oven was possible. Only the chill was removed from weld zone with oxyacetylene torch.

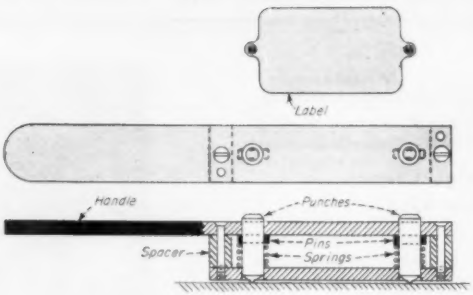
Using a 5/32 in. EutecTrode 24, at about 130 amp to start—amperage was reduced as casting warmed up. Then short 1-in. stringer beads were deposited, alternating from one end of crack to other. This prevented building up high localized heat. If casting showed heat color, we stopped welding immediately. Each bead was peened while still hot. Arc was maintained on weld puddle at all times, never on base metal. That allowed molten filler metal to flow ahead. There was not a single failure or cracked weld. Power plant has been operating steadily since March 1951.

FRANK ROMANO *Flushing, N. Y.*

Camphor Finds Oil

A SIMPLE TEST for oil in boiler waters is lump camphor bought at drug stores. When added to a water sample, camphor spins back and forth in absence of oil. A small trace of oil in a sample, and the camphor flakes will remain stationary. This is a reliable test.

I. FITZPATRICK *Jefferson City, Mo.*



Hole-Marking Gage for Labels

AS PART of our maintenance program, we fasten a brass plate to each piece of equipment. Plate has various data stamped on it. It is made of strong brass sheet material about 1/16 in. thick. All are same size, stamped in quantity on punch press.

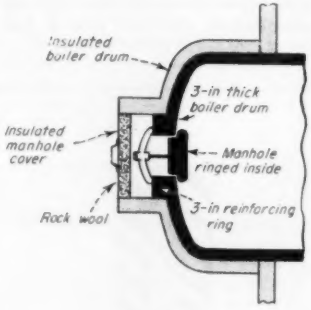
Holes for fixing screws are already punched in each plate. Then maintenance crew has only to drill two holes in each machine for fastening the plate. Screw holes are drilled with a portable electric drill.

For marking holes, we made a centering tool, sketch. This has two hardened punches of drill rod, placed correct center distance apart. Framework of centering tool has top and bottom plates with reamed holes for punches. Top plate is extended in length to form a handle.

Top ends of punches protrude above surface of top plate so they can be hit with a hammer. Punches' pointed lower ends project slightly below bottom surface. Then when one punch has been struck, projecting point of punch can engage with this punch mark and second is struck. Punches are held back with a light compression spring on each one. Tops of springs press against washer, which is backed by a cross-pin drilled through each punch.

We made several centering tools and issued them to various maintenance men. This will pay on big jobs.

F E RILEY *London, Eng.*



Manhole Plates Need Insulation

REMOVABLE COVER-PLATES on boiler drums often go uninsulated. In our plant we try to prevent all heat loss which also helps make it comfortable.

Boiler drum shown carries 1500 psi at 1000 F. Cover plate of manhole has 5-in. loose rock-wool as shown. Boiler and drum ends were insulated with 1½ in. high-temperature block and backed up with 2-in. magnesia block.

J STORMBURGER *Rochester, N.Y.*

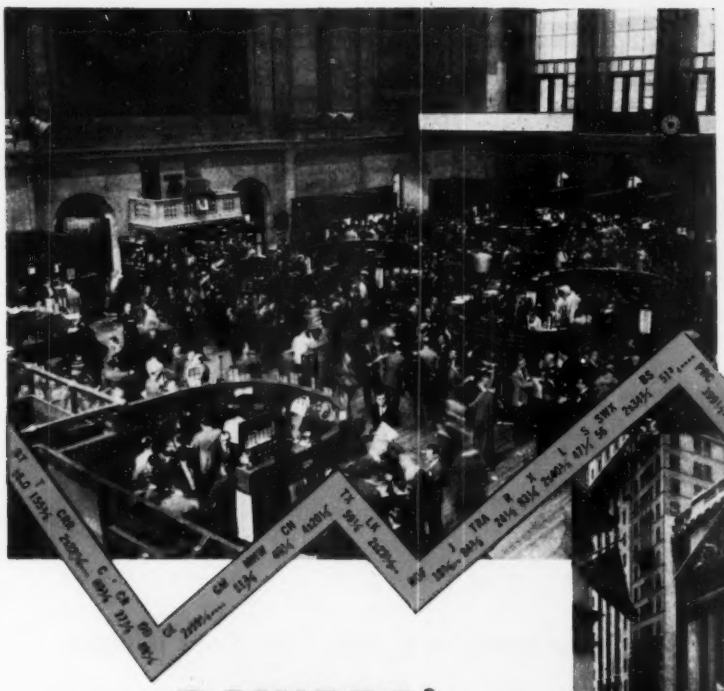
Try Grains per Gallon

WHILE PARTS PER MILLION readings are used for water adjustment in many plants, grains per gallon offer economies for plant water adjustments.

Using chemical dropper, 1 drop 0.5 normal sulfuric acid in 10 ml test-tube sample equals about 8 gal per min, or 140 ppm alkalinity. Boiler-water sample can be quickly tested. This test gives good control during blowdown as progress can be easily checked.

L FITZPATRICK *Jefferson City, Mo.*

(*Continued on page* 128)



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The Nation's Largest Securities Market Place

Erected in 1903

Architect: George B. Post
Ventilating Engineer: Alfred R. Wolf
Refrigerating Engineer: Henry Torrance

Consulting Engineer present air conditioning system: Charles S. Leopold

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AIR CONDITIONING CONTROL

Used in this World Famous Securities Market

No matter how the "temperature" of the market fluctuates, air conditions on the trading floor of the Stock Exchange remain stable throughout the year.

Back in 1903 the New York Stock Exchange pioneered with the installation of a comfort cooling system which Mr. Donald A. Kepler, Chief Engineer describes as follows:

"It was one of the first systems of its kind applied to a large densely populated market place and by far the largest plant devoted primarily to air cooling and dehumidification. No controls were employed in the cooling season but in winter temperature and humidity were automatically controlled by a pneumatic system.

The air conditioning system now in use, the third since 1903, is modern and reflects the progress of air conditioning during the past 50 years."

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When temperature and humidity control problems arise contact Powers nearest office. Our 60 years of experience gained in many important buildings may be helpful to you.

Factory and General Offices: Skokie, Ill.

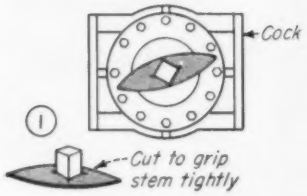
Mr. D. A. Kepler, Chief Engineer, in the photograph above, reports temperature is held within limits of approximately 1° F. plus or minus.

POWERS CONTROL

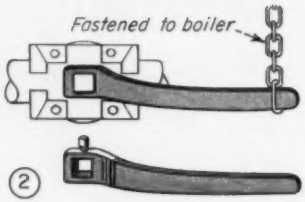
(n94)

OFFICES IN OVER 50 CITIES **THE POWERS REGULATOR COMPANY** Established 1891

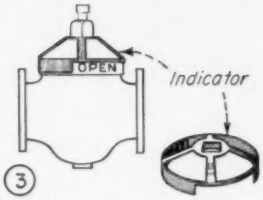
Begins on page 124



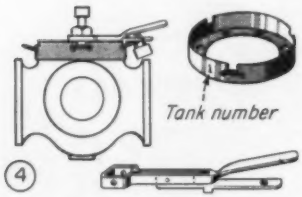
Main cocks for fuel-oil system



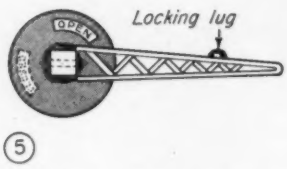
Small gas cock operated rapidly



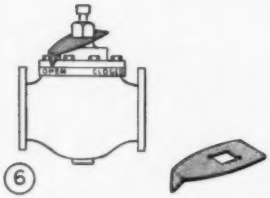
Large burner gas cock on boiler



Oil return cock on large system



Cocks on wall, floor or fire stop



Above eye level cock up on runs

Indicators Show Position of Plug-Type Cocks, Also Lock Cock in Place

COCKS ARE INSTALLED in plants for many uses, but common problem is to know at a quick glance if cock is open or shut. Here are six practical ways I solved this problem.

1—For main gas cocks supplying fuel to plant, make indicator shown from light gage metal. Slip snugly over stem and paint a brilliant color.

2—For small cocks where you must operate several cocks in rapid succession. Useful on boilers having several gas burners from a common header across boiler front.

Chain is needed to slip over handle or handle's weight will open cock. Make handle shown from $\frac{3}{8}$ to $\frac{1}{2}$ in. flat iron.

3—For large cocks where it's important to know cock's position, such as gas burner cocks on boilers.

Stencil the words OPEN and SHUT on cock body at flange. Place indicator so either one word or the other shows. Make of light metal and weld to form shown. Fit snugly over the stem so that it stays on.

4—For large cock, such as on oil return lines to fuel-oil storage. Locking prevents unauthorized persons tampering. Also prevents error in changing return oil to storage.

Weld three lugs to collar and drill for padlock. Cut slots in indicator to fit projection on locking lever as shown.

5—For large cocks on outside walls, firestops, floors, etc. Especially handy if, for safety, cock must be operated from remote position and if position of cock must be known. In such cases stem is long and extends through floor or wall. Locking lug on handle is for locking to small lug or bracket attached to wall, or floor. Stencil words OPEN and CLOSED on wall or floor or on stationary plate and have indicator turn with stem to uncover position of valve as valve is turned.

6—Use on cocks that are on runs above eye level, to indicate position of cock instantly. Stencil words OPEN and CLOSED on valve body as shown. Fit indicator to stem so it is snug and paint bright color.

A W SHEPHERD *San Diego, Calif.*

Wire-Bending Pliers Make Adjustable Pin-Wrench

WE HAVE VARIOUS-size flexible-back disk sanders in our maintenance shop. All nuts holding center of abrasive disk to flexible back have two holes for engagement with a pin-ended wrench. But wrench is always lost after first user has done a job with sander.

I made my own pin-ended wrench and it fits all nuts on our sanders. Photo shows cheap pair of round-nosed wire-bending pliers made into a wrench.

Plier jaws are ground down to fit into smallest holes in nuts. Even if jaw ends are a sloppy fit, they tighten and undo the sanding disk nuts. If jaws are ground down on outside surfaces only, as shown, pliers can still be used for bending eyes and other shapes in wire. This tool has saved hours of searching for a suitable wrench or suitable makeshifts when changing abrasive disks.

F E RILEY *London, Eng.*

IN FAR OFF INDIA IT'S YARWAY

AKISTAN

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BOKARO STATION
WILL USE 24 YARWAY
UNIT TANDEM BLOW-OFF VALVES

India's great new Bokaro Station — the largest steam power plant in the Far East — will have its eight 300,000 lbs. per hour steam generating units equipped with Yarway Unit Tandem Blow-Off Valves.

Bokaro was engineered and constructed by The Kuljian Corporation — who know that the good design, quality materials, and careful workmanship of Yarway Blow-Off Valves mean dependable service, so important in modern power plants. That is why *4 out of 5 high pressure boiler plants today are equipped with Yarway Blow-Off Valves.*

Yarway engineers, trained and experienced in solving steam plant problems, are located near you. When you need help—call a Yarway man.

YARNALL-WARING CO.
100 Mermaid Ave., Phila. 18, Pa.
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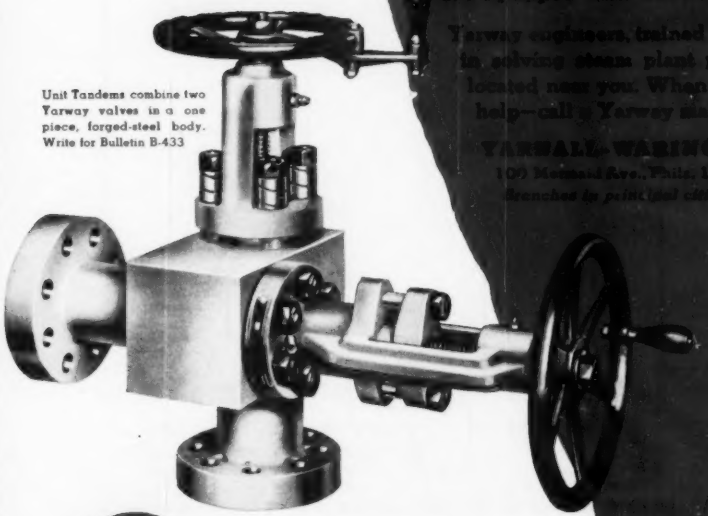
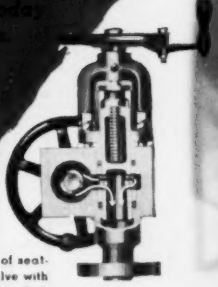
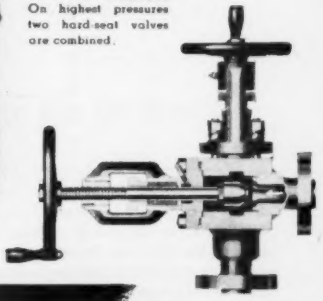
Unit Tandems combine two Yarway valves in a one piece, forged-steel body. Write for Bulletin B-433





Cross section of seatless sealing valve with famous Yarway balanced sliding plunger. On highest pressures two hard-seat valves are combined.



. . . YARWAY SERVICE GOES ALL THE WAY

Cross section of hard-seat blowing valve with mated stellite-faced disc and integral welded-in stellite seat.

PLANT PROBLEMS... *put your know-how to work*

How Can We Spot Oil in Our Condensate?

HERE ARE THE FACTS: Our 3500-lb-per-hr boiler runs at 80 psi. It supplies steam to 15 coil-type heaters in the plant.

These heaters are submerged in lubricating oil, which we process in our manufacturing area. Each coil has a separate steam trap that discharges to a gravity-type return line.

Every now and then a coil springs a leak, allowing oil to enter. This oil returns with the condensate to the boiler.

We've been wondering if *Power* readers ever solved a problem like this. How can we detect oil in condensate from the coils? Is there any device that will separate this oil from the condensate? What are good hookups to cure this trouble?—*HF, July Power*

Here Are the Answers

STOP VACUUM in heater coils by fitting a ¼-in. check valve to heater inlet. Then when steam is shut off, check valve will open and admit air to coil. Breaking the vacuum prevents oil from being siphoned into the coil.

I. R. MEYER *Cincinnati, Ohio*

SIGHT GLASS in return of each coil helps spot leaks. Good sights can be purchased or made up from spare parts. There are many good oil separators on the market that effectively remove oil from the condensate.

J. P. MULVEY *Yonkers, N. Y.*

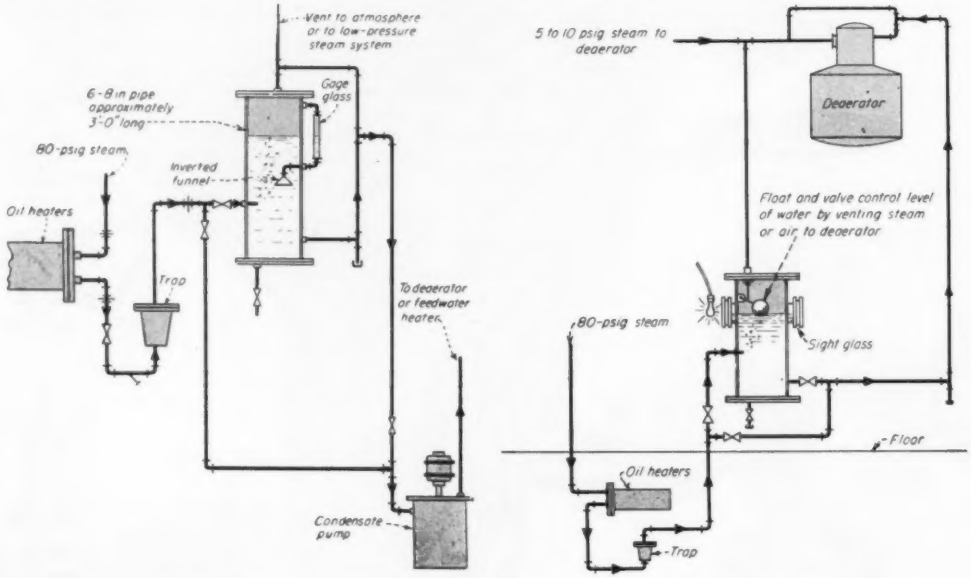
LIGHT INSPECTION-TANK interior with a bulb so condensate can be seen through an inspection port. Fit one drain for floating oil and another for condensate. Pipe discharge from inspection tank to a feed and filter tank.

To stop leaks in oil heaters use thermostatically controlled steam valves for steady heater temperature. This reduces tube expansion, contraction. Keep heater pressures within design limits. Be sure all packing in heater is tight. Then there won't be any oil leaks.

EDWARD DELNICK *Brooklyn, N. Y.*
LEONARD POLIFOFF *Brooklyn, N. Y.*

GREASE EXTRACTORS used with inspection tanks do a good job because they allow *HF* to get rid of oil cheaply. If extractors won't remove all oil, fit hotwell with charcoal and towel filters. You can get fine results with them.

K. W. LUMAN *Parkersburg, W. Va.*



MY IDEAS on separating oil from condensate are based on experience as an operating and design engineer. To date they haven't been put into use.

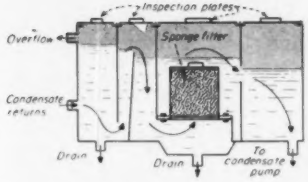
Left sketch shows oil-heater trap discharging to a separating chamber that can also serve as a flash chamber. Oil will show in gage glass so operator can correct the condition.

Hookup in right sketch is for small plants where high-pressure condensate goes to deaerator or open feed heater instead of going through a condensate pump. Since pump head requirements fix deaerator or open heater elevation, I arranged this hookup so separation chamber is at the operator's eye level.

G. F. CONNELL *Detroit, Mich.*

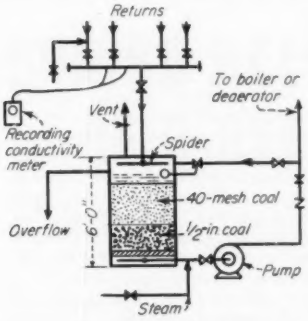
help the other guy cure his headaches

TYLER HICKS, *Associate Editor*



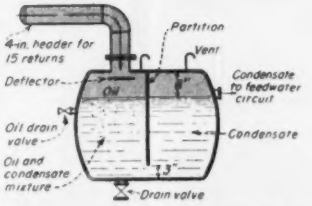
FEED AND FILTER TANK in sketch is good for separating oil from condensate. Loofa sponges used in tank are inexpensive. Boil in hot lye water of moderate strength and run through a wringer to remove oil from the sponges.

H E ALEKNA *Brownsville, Texas*



GRADED ANTHRACITE coal bed makes an inexpensive filter for removing oil from condensate. Flow rate through filter shouldn't be more than 4 gpm per sq ft of bed area. Free trapped oil by boiling bed out with steam for two hours every day. Hook conductivity meter to your return line and fit with an alarm to give warning of oil contamination. Sketch shows the hookup.

MELVIN EVANS *Chicago, Ill.*



ONE SEPARATOR for all returns is better than one at each coil outlet. Sketch shows an oil-water separator that depends on specific-gravity difference for separation. Tank has an internal partition and deflector plate large enough to settle particles. Condensate outlet is higher than oil outlet.

Fit a tee at outlet of each coil trap so discharge can be checked for oil. If *HF* finds that one coil discharges oil, he can isolate it from the others for repair. Open separator oil outlet once a day to check the system.

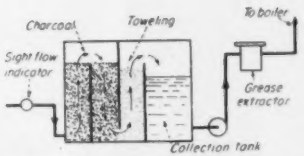
A. J. BREUGELMANS *New York, N. Y.*

CONDUCTIVITY METER having a recorder and alarm detects soap, fatty acids, tallow and other contaminants in our condensate. When alarm goes off we open a bypass valve to let condensate run to sewer. When contamination clears up we bypass the sewer and send condensate to the feed heater.

C W PARKS *Overlea, Md.*

TWO CONDENSATE TANKS do the trick. While condensate from one tank is used to feed boiler, the other tank collects system returns. When tank is full its contents are tested. If oil-free, the tanks are switched over.

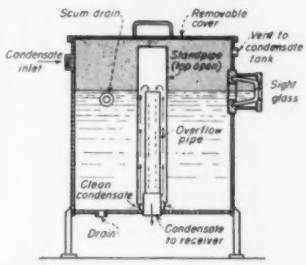
ART CANNON *Laurence Harbor, N. J.*



USE FLOW INDICATOR with a glass sight after the steam trap on each heater. Then you can see oil floating on condensate. Where large amounts of oil must be taken out, an open feed heater with charcoal and towel filters is good.

HF should use a twin-basket grease extractor on condensate-pump discharge, as shown in sketch. As his heater coils wear out he can replace them with welded units. He'll have fewer leak troubles with these.

W K ROWLEY *Orlando, Fla.*



SAME EQUIPMENT used to detect oil leaks in steam-heated fuel-oil heaters is good for *HF's* plant. Sketch shows an inspection tank that will separate oil from condensate, allowing only clean condensate to leave tank. Oil floats on top of condensate surrounding center

(*Continued on page* 194)

Is Chemical Cleaning Good For Our Plant?

HERE ARE THE FACTS: Scale in our watertube boilers and our heat exchangers gives us a flock of troubles. Friends suggest acid to cut cleaning work, cost. I've never used acid to clean heat-transfer surfaces and I'd like to know how *Power* readers handle it.

What acids are good for cleaning? Is heat generated by the reaction? What inhibitors are best for power-plant equipment?

Is there any danger to plant personnel when using acid cleaning? What's best procedure in cleaning boilers and heat exchangers? Are any testing devices needed? Will this method reduce number of men needed for cleaning?—*RP, July Power*

Here Are the Answers

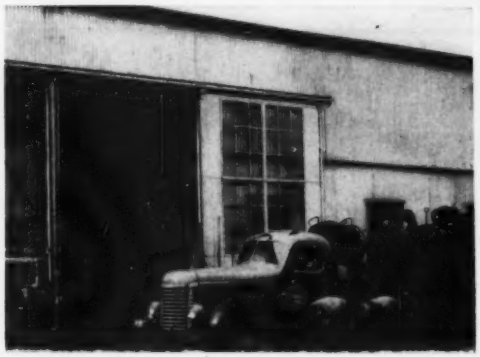
DON'T SPILL ACID. It can give you plenty of trouble. When we started our chemical cleaning a jar broke in the engine room and acid ran onto the floor and into a bus trench. The whole plant was shut down an hour. Now we're more careful when unloading carboys.

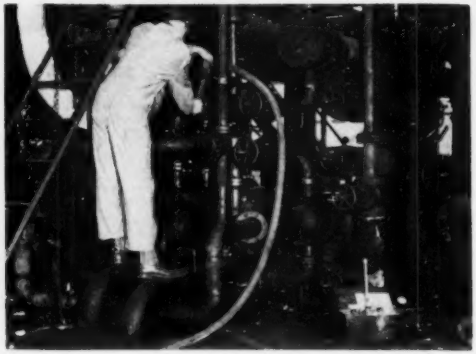
G. C. LEWIS *Vancouver, B. C.*

(*More on next page*)

More PLANT PROBLEMS

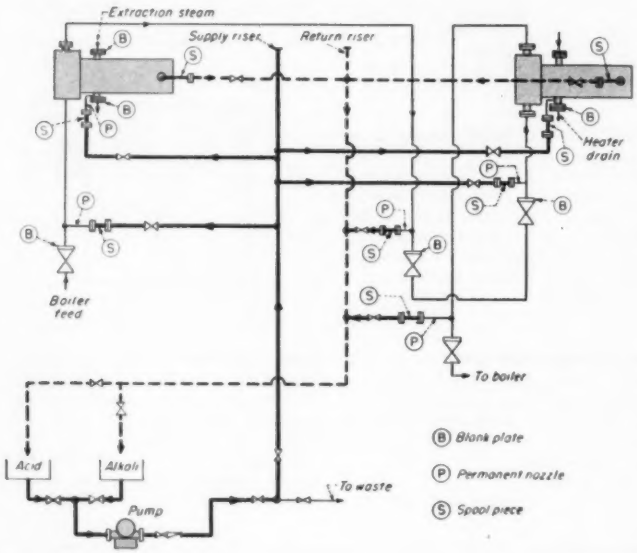
Begins on page 130





HOOKUP PHOTOS show some of the equipment acid-cleaning firms use for power-plant jobs. At left, temporary lines are run to a place where it is convenient for service truck to unload. At right, contractor's engineer hooks up hose to heat exchanger. Pump for solvent circulation is on truck.

PAUL LANE *New York, N. Y.*



CHEMICAL CLEANING of power-plant boilers and heaters gives good results. Clean high-pressure heater when water leaving temperature is too low or when pressure drop through heater is high. Clean boilers with acid about every two years.

Use same chemicals for both jobs. Cleaning solution may be 5% hydrochloric acid with an inhibitor. Rinsing solution is soda ash.

Have deposits analyzed by a firm specializing in chemical treatment before starting work. Sketch shows one way of hooking up system for chemical cleaning of heaters. Symbols indicate recommended locations for blank plates, permanent nozzles and spool pieces. Chemical pump is used for both the acid and alkali. Drain solution to waste after use.

Find reaction time between solvent and deposit by making chemical tests of solution leaving heater. Pump a neutralizing rinse of 10% caustic soda through heater shells and tubes after acid wash. Acid is usually stored in carboys before use.

Feed chemicals to boiler through lower waterwell header. Run a temporary vent from top of steam drum to a point outside building for gas removal.

Pump acid into boiler until level is about 6 in. from top of steam drum. Allow it to soak about six hours. Then drain boiler quickly by piping nitrogen gas into it. When boiler is empty, rinse twice by filling to top of steam drum with softened water. Drain quickly under nitrogen-gas pressure.

To stop after-rusting, fill boiler with ½% soda-ash solution. Light off fires and hold about 25% of normal pressure for six hours. Reduce boiler pressure and temperature as quickly as possible and inspect drum surfaces.

Run a hydrostatic test using treated water before boiler goes back on line. Check for leaks at the gaskets.

A J BREUGELMANS *New York*

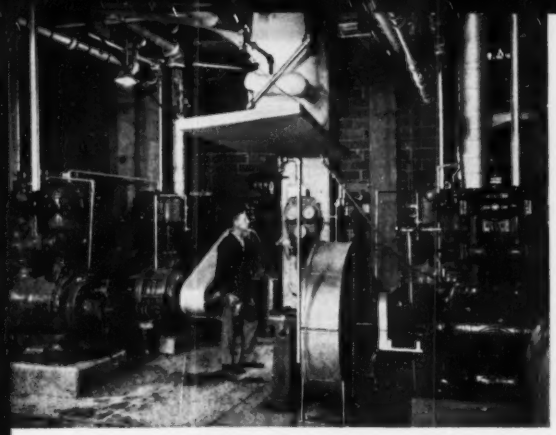
NEUTRALIZE BOILER, after acid cleaning, before you enter. Flush it out at least twice or you may run into trouble. Fewer men are needed for acid cleaning and you get better results than with either hand or mechanical cleaning.

R P MARCHE *Bloomfield, N. J.*

INTERNAL TREATMENT of boiler water with pretreatment of raw water can remedy mild scale conditions. Get a chemist to recommend best treatment and try it before using acid. Acid can be dangerous if used by unqualified men.

A VINCENT *Hudson, Mass.*

(*More on page* 134)



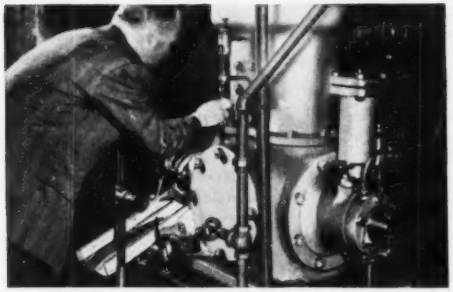
COMPRESSOR EFFICIENCY UP 15%. Six years ago, these Frick compressors were losing efficiency because the oil formed excessive lacquer and carbon deposits. Clogged lines made frequent overhauls necessary. The company changed to Suniso Refrigeration Oil and its natural detergency immediately began attacking the deposits throughout the system. The carbon and lacquer deposits were rapidly carried away to traps and filters, and the system was soon entirely cleaned. Since then compressor efficiency has increased 15%.

SLUDGE AND WAX ELIMINATED. A firm engaged in constructing and servicing industrial refrigeration equipment had constant trouble with compressor oils. Every oil tried lost viscosity excessively under high operating temperatures, vaporized and formed sludge, or formed wax at low temperatures. Complaints were numerous and time lost on call-backs was costly. After consulting compressor manufacturers, the company switched to Suniso. This product immediately solved all sludge, wax and low temperature problems.

SUNISO HELPS INCREASE EFFICIENCY OF 3 REFRIGERATION SYSTEMS

Here are typical examples of how Suniso Refrigeration Oils are helping increase compressor efficiency and are keeping refrigeration system maintenance to a minimum. Following the lead of original equipment manufacturers, more and more maintenance men and refrigeration engineers are safeguarding the efficiency and reliability of their compressors with Suniso.

Suniso Refrigeration Oils meet the requirements of *all* compressors and *all* refrigerants. To get more information, just fill in and mail the coupon below.



SEPARATION TROUBLE ENDED. In this 15-ton ammonia compressor, the oil discolored badly and failed to separate properly from the refrigerant. Excessive amounts of oil carried over into the separators, lowering the efficiency of the entire system. With a switch to Suniso, separation, carryover and discoloration problems ended.

SUN OIL COMPANY—Department P-10
Philadelphia 3, Pa.

☐ Please send me a copy of the illustrated booklet "Suniso Refrigeration Oils."

☐ Please send me a copy of the technical bulletin "Lubrication of Refrigeration and Air Conditioning Equipment."

☐ Please have a Sun representative contact me.

Name_____

Title_____

Company_____

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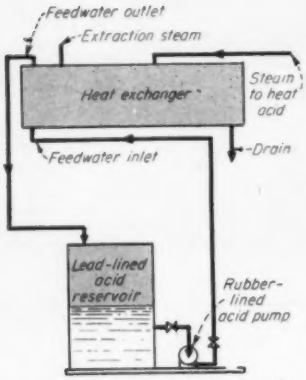
SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO

More PLANT PROBLEMS

Begins on page 130



SUPERVISED CLEANING, under a competent chemist, gives best results. Large units like boilers are cleaned best by a firm specializing in this work. Cost is usually less than when plant personnel does the job.

Muriatic acid is efficient and economical for cleaning heat-transfer surfaces. I've found an acid temperature of 140 to 150 F is best for a deposit that is mostly iron oxide. Choose inhibitor carefully. Sketch shows hookup for acid cleaning a feedwater heater.

Procedure we use may also be good for *RP*. Here it is:

1. Hang NO SMOKING signs near heater and check to see that all safety equipment is handy.

2. Close heater's valves to take it out of service.

3. Connect rubber-hose acid feed line to heater water inlet.

4. Run a line from water outlet to the acid tank. Vent waterbox through a small line.

5. Open condensate drain valve. Attach steam line to steam side of heater so acid can be heated.

6. Fill acid tank with 5% solution and start pump. Use 2% solution for carbonate scale. Add inhibitor as needed to keep acid solution at 5%. As solution strength decreases during cleaning, add acid. Check acidity until it remains constant. Continue washing for one to two hours after acidity reaches a fixed point.

7. Drain acid and wash heater with water. Check with methyl orange indicator until all traces of acid are gone. Soda ash rinse may be desirable after the first water rinse. Then follow with another water rinse. This will remove any acid remaining in heater.

E W BRUMITT
Indianapolis, Ind.

TEST SCALE from upper steam drum by dropping it in a 50-50 acid-water mixture. If scale dissolves quickly a weaker mixture can be used. If scale breaks down slowly and separates, a stronger mixture is needed.

Carbonate scales react rapidly; silica scales are more complex and react more slowly. Scale doesn't have to dissolve completely during chemical cleaning. All that is needed is flaking off and removal from drum and tube surfaces.

Here's our cleaning method; *RP* may find it helpful in his plant.

1. Fill boiler one-third full with raw water.

2. Feed concentrated inhibited acid directly from carboy through acid-resistant pump and plastic hose.

3. Fill boiler to top after you get right acid concentration. Leave manhole doors open so gas can escape.

4. Flush boiler with raw feedwater after reaction has slowed and pH of mixture in boiler is nearly 5.

5. Leave blowdown lines open and test flushing water until it is neutral.

6. Flush the boiler once again. Then replace the gaskets and refill with feedwater and an alkaline phosphate to raise your pH to 10.

I. W FITZPATRICK
Jefferson City, Mo.

SAFETY FIRST is the best motto when handling acids. Use eye shields and rubber gloves. A few common mistakes in acid cleaning are wrong handling of acid, too much circulation, and allowing metal to overheat. Experience proves that it is safer, quicker and more economical to have qualified contractors do your cleaning on a contract basis.

F B MACHOL *Painesville, Ohio*

READY PLANT for chemical cleaning firm before they start work. Furnish scale sample several days before cleaning starts. Find out what is needed in the way of steam, water and sewer connections. Keep plant roads clear and have several pipe fitters on hand.

When chemical cleaning is finished your work begins. You may find small leaks in places that were tight before cleaning. That means scale acted as a patch, and you must tighten poorly fitted valves and tubes. Replace manhole, handhole, gage-glass gaskets.

C F BLACK *Cleveland, Ohio*

SEE A SPECIALIST first. Get his advice. Then read POWER, July, pp 74-75, for latest info on price trends.

H W CONGDON *Auburn, Mass.*

(*Continued on page 194*)

YOUR NEW PROBLEMS

1 How Does Water Get Into Fan Bearings?

One boiler in our plant has a 34-in.-dia turbine-driven f-d fan. It's a propeller-type unit driven by a single-stage turbine using oil-free exhaust steam.

Turbine seals on the shaft are mechanical type. Fan has two bearings, with oil supplied from a reservoir by a gear pump at the end of the shaft.

Recently we've been getting water in oil reservoir. The first time it got in we kept turbine running without changing the oil. Both bearings burned out and had to be replaced.

Now we drain reservoir oil every week. If we don't, bearings fail after about two months.

How does water get in these bearings? What can we do to stop it? We've had the manufacturer's engineer in, but he's just as puzzled as we are.—*KC*

2 How Can We Cut Tower Windage Loss?

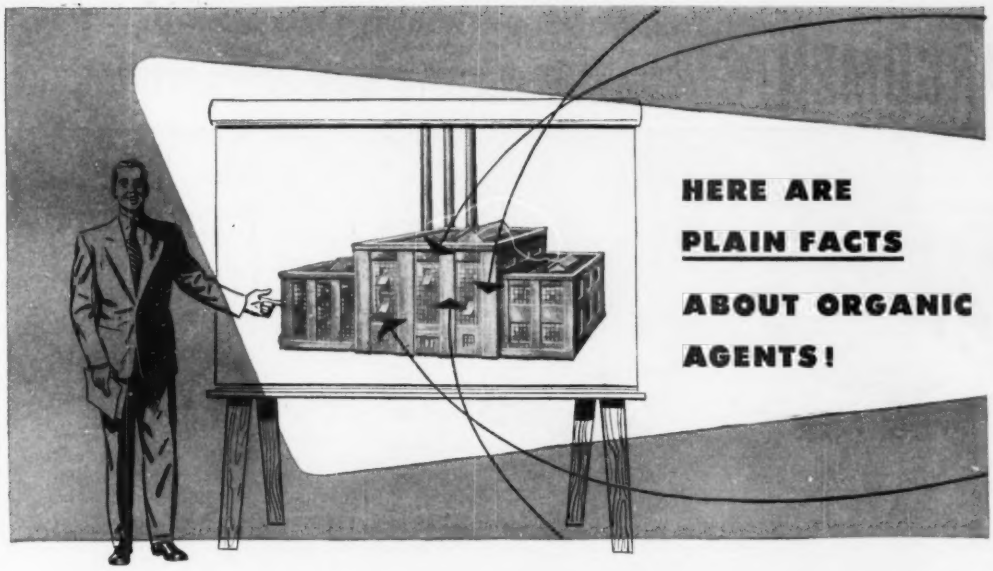
We use a large amount of cooling water in our manufacturing plant. This water is circulated through cooling towers to reduce its temperature after it comes from process and power-plant heat exchangers.

Plant has six cooling towers: two forced-draft, two induced-draft, and two natural-draft type.

Windage losses in the two natural-draft towers are so bad windows in nearby buildings must be kept closed. Roof vents and other metal structures near these towers show more corrosion than those on other buildings.

How can we reduce windage losses from these towers? Is it possible to install fans on natural-draft towers and get the same or better cooling range? Does windage loss increase tower delignification?—*BE*

Will you help readers who sent us problems? Extra pay for photo or sketches



HERE ARE PLAIN FACTS ABOUT ORGANIC AGENTS!

Many times the full and proper use of organic agents is not included in a water conditioning program. And many times the results are far from satisfactory.

Take, for example, the case of a large paper manufacturer who was having considerable difficulty with blistered tubes which resulted in plant shutdown. The major difficulty with tube burnouts was confined to a single 500 psi unit rated at 200,000 pounds of steam per hour. Thin, hard scale developed in the first row of generating tubes exposed to the most intense heat.

With internal treatment by inorganic agents alone and the continuous maintenance of adequate soluble phosphate content of the boiler water, forced outage due to tube burnouts occurred three or four times yearly. And, the boiler was turbined at least twice yearly.

Betz engineers studied the problem and recommended the use of organic agents to supplement the external softening and inorganic treatment. Results? Since the application of organic treatment, no tube losses have occurred due to internal conditions for seven years! In fact, the boiler has operated for over three years without turbining or acid cleaning! Under present plant operation, the need for turbining or acid cleaning is not anticipated.

If your plant is plagued by scale and sludge deposits, why not do something about it *now*, by calling in a Betz Engineer. He'll show you factual evidence how Betz *Specialized* Water Conditioning Service can help you solve your water problem. W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

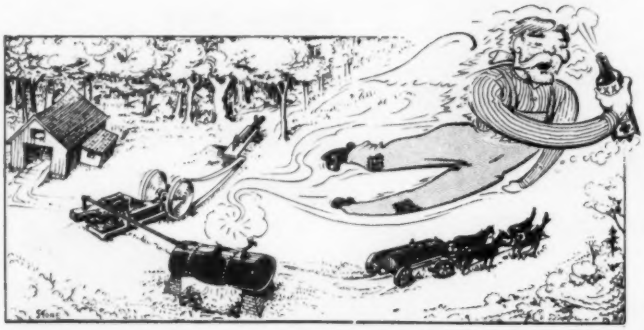
Write today for a copy of Betz Technical Paper No. 98, "Boiler Scale —Its Formation and Prevention."

BETZ

CONSULTANTS ON ALL WATER PROBLEMS

ARGUMENTS

Here's the place to unload your gripes to editors, manufacturers and fellow engineers



A Deafening Roar and a Mushroom of Smoke

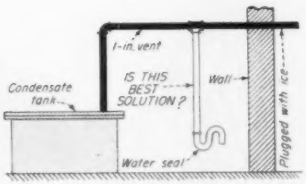
ALL THIS TALK about burning black liquor (p 88, May POWER) has got me plenty worried. Now I've never been in the paper business, but having been reared in backwoods logging camps I've seen some weird concoctions consumed by the sons of Paul Bunyan.

I recall the time Oley, our four-horse skinner on the water tank, raided the medicine chest above the horse-barn door. Now Oley was a valuable man. He kept the old wet-bottomed 1901 traction-engine boiler in water of an interesting color from a nearby swamp. And the only thing that worried us was the old kettle with its ½-in. bulges between every stay bolt all the way around.

Oley must have sidled up a little too close to the open flame one night because the blue glow seen over the tall pines followed by a deafening roar and a mushroom of smoke caused us to cry, "The boiler is gone." But so help me, when we got to the mill, there she stood proud as punch with most of her stays and tubes still hissing. But Oley had left for parts unknown. Ain't nobody seen him since.

Now figgerin' they've tamed black liquor down for burning in the paper industry, what I'd like to know is, "How does Oley's brew compare with Marmy's Sandpaper Gin?"

K R MCCORMICK *Edmonton, Alb.*



Vent Too Small

I CAN'T GO ALONG with A Walter's remedy in Practical Ideas (p 128, July POWER) for venting condensate-return tank, sketch above. Chance of a 1-in. gooseneck becoming clogged with scale, etc., is too great a one to take. There is also the possibility of vent line running to floor acting as a siphon should the tank overflow.

A 1-in. vent for even a small condensate-return tank is too small to begin with. Had Mr Walter increased size of vent, then increased it even more where it extends outside of building, he might not have had any trouble with it in the first place. That's only a guess, though.

A CANNON *Laurence Harbor, N. J.*

Paddy's Goat

I WAS AS CONFUSED and befuddled as Mr Cannon (p 136, Aug POWER) over how a man could go in an' out of a boiler manhole with his head under his wing the way Mr Reilly did down Georgia way.

Sure it got me to thinkin', that it did. I asked myself, "How in the name of Paddy's goat did Reilly do it?" And just as sudden as if that same goat had butted me where my pants leaves the singular for the plural, I had it! That same Mr Reilly must be one of the "Little Good People" from over County Cork way.

Now there are two sides to every story, and I'm thinkin' that Reilly says what he says cause there's fact in it . . . and he should be believed.

B HARDING *Morristown, N. J.*

Barny Defends the Cause

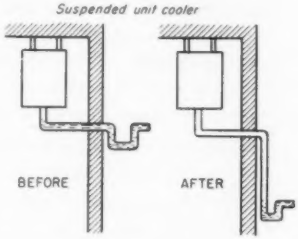
THE SOUTH surrenders again. In answering H A Jahnke (p 125, Mar POWER), I was thinking only of our plant. We have three power boilers and three recovery boilers, and on each boiler at the steam and mud drums there is a platform in front of the manhole where a maintenance man can enter with ease.

We have a real power plant down here in Georgia . . . boilers, turbines, water-treating plant, etc . . . not a sawmill job where you need a ladder or sky hooks to enter a manhole. We do everything we can to make working safe.

As for sea duty, I put in my time . . . and when I was 15, too.

B D REILLY *Brunswick, Ga.*

We're still wondering, Mr Reilly. Just how large are your manholes?—ED.



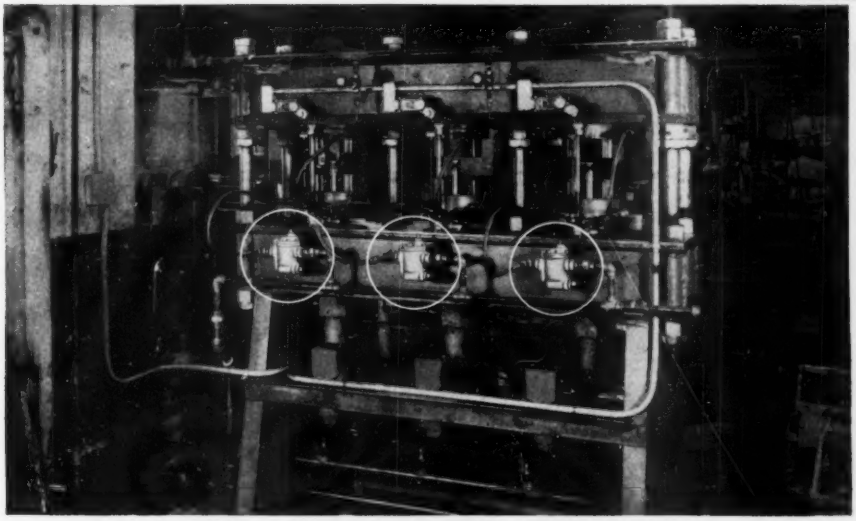
Goosenecks Too Close to the Goose

THE REFRIGERATION trouble-shooting article by C T Baker (p 114, Aug POWER) is very good. But for the benefit of many POWER readers who may attempt to duplicate the gooseneck idea, would Mr Baker please explain how he prevents a freeze-up in the gooseneck at –20 F?

We generally place the water seal or gooseneck at the lowest point in the drain line, which prevents warm air from entering or cold air from escaping, but which will not freeze in or at the gooseneck of either manual or automatically defrosted freezing units.

C BACHMAN *Rego Park, N. Y.*

Relies on Armstrong "Unit Trapping" to maintain molding press temperatures within ±5°F.



Uniform molding temperatures reduce leather cup rejects by 40%!

MANY a plant has accepted erratic temperatures of steam heated equipment as a necessary evil. Not so at Albert Trostel & Sons Company, Milwaukee, manufacturers of molded synthetic rubber and leather parts. They unhesitatingly replaced an electrically heated molding press, that varied in temperature as much as 30°F., with a steam heated press because they knew from previous experience that Armstrong Unit Trapping would give them uniform temperature control. Their confidence was not misplaced. An indivdual Armstrong steam trap on each station of the press keeps temperatures uniform within plus or minus 5°F. Molded leather cup rejects have been reduced by 40% and production greatly increased.

The benefits of Armstrong Unit Trapping are easy to understand. First, if you drain more than one unit with a single trap, any variation in pressure between the units will cause condensate and air from a higher pressure unit to block drainage from a slightly lower pressure unit or section. With an individual trap on each unit this cannot happen. Secondly, Armstrong traps discharge condensate and air as fast as they accumulate so that every unit is always full of hot dry steam and, hence, at maximum temperature.

Let your local Armstrong Representative look over your condensate drainage system—he sells Armstrong traps under a *satisfaction-or-your-money-back guarantee.* Call him or write:

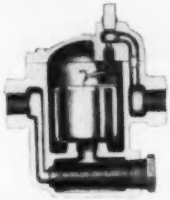
ARMSTRONG MACHINE WORKS

812 Maple Street • Three Rivers, Michigan

See Our Exhibit, National Power Show
Grand Central Palace, New York, December 1-6

You Always Get Greater Efficiency When You Use Armstrong Unit Trapping

BONUS VALUE



Built-in Strainer Trap Saves Money, Maintenance

Small traps need strainer protection against dirt and scale. Howard Knoller, V.P. & Plant Engineer of Albert Trostel & Sons Company, uses and likes Armstrong No. 880 traps with built-in strainers because: they cost less than a trap plus separate strainer; save fittings and installation labor, and the strainer can be cleaned without removing trap or shutting off steam.

FREE
44-PAGE
STEAM TRAP BOOK
Gives Complete Data

FILL IN AND CLIP TO YOUR COMPANY LETTERHEAD

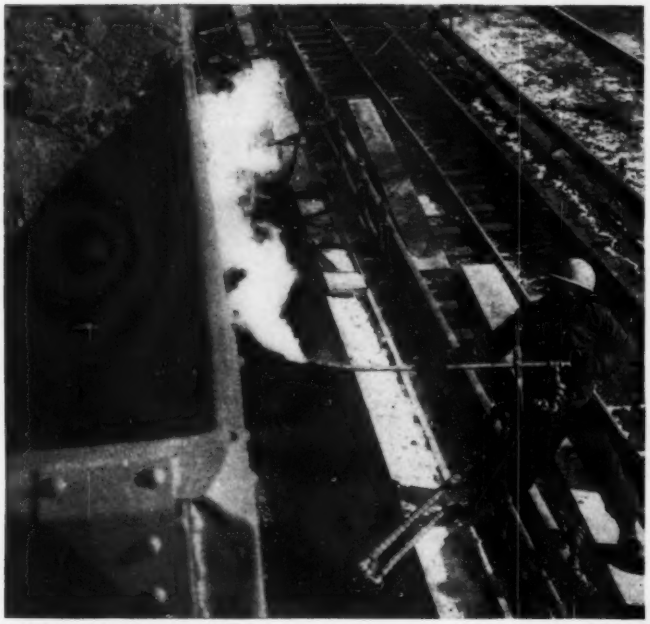
ARMSTRONG MACHINE WORKS
812 Maple Street, Three Rivers, Michigan

Please send me The Steam Trap Book.

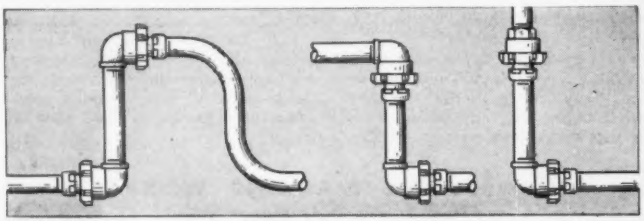
Name .....

Title .....

HOW TO Use Ball Joints for Steam Service



FROZEN COAL, ORE OR SAND is thawed with steam lance made of ¾-in. ball joints and piping. Flexibility of line depends on number of joints used, but safety factor is that of the piping. This setup was developed after continuous trouble and failures of several other hookup types. They proved costly and not very practical



ARRANGEMENT at left is for straight line instead of U-bends. Center sketch shows use where pipe is or can be provided with offsets. Right sketch shows ball-joint arrangement for expansion between vertical and horizontal application. With this hookup, expansion or contraction of both lines will not bind or strain the piping

EXPANSION was tough on this 550-F steam line at 1000 psi until ball-type joints were used. This is part of piping for testing controls and other devices

EXPANSION AND CONTRACTION can be tough on steam lines, especially at high pressures and temperatures. There are also services requiring flexible lines, such as the flexible metallic or bellows-type hose, where ball-type joints with piping may be better suited for various reasons.

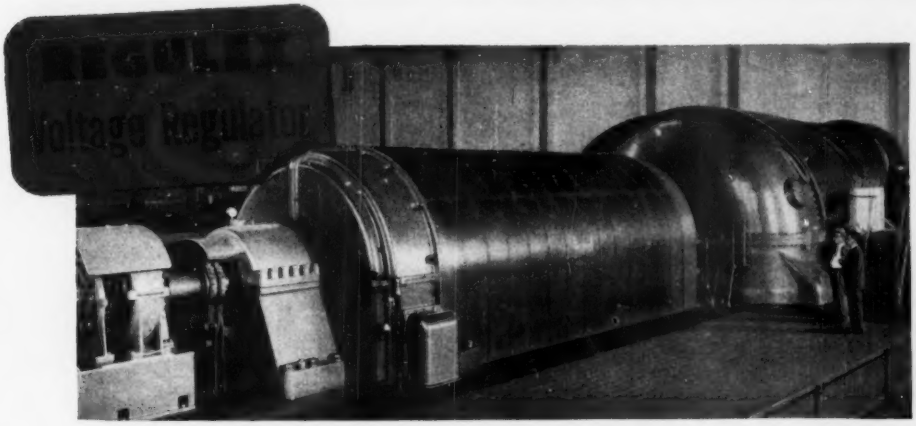
Illustrations show how ball-type joints can be applied to various uses. Joint is kept tight with a gasket, tightened just enough to allow movement without leakage. Because of very slight movement, joints last without attention for long periods of time, especially where only movement is from expansion and contraction.

For best results, use correct arrangement of joints for each application, as shown in sketches. Sketch on left shows arrangement in straight line, replacing conventional expansion U-bends. Center sketch is used where pipe is or can be provided with offsets. Right sketch is arrangement for expansion between vertical and horizontal application.

Courtesy, Barco Manufacturing Co, Chicago, Illinois

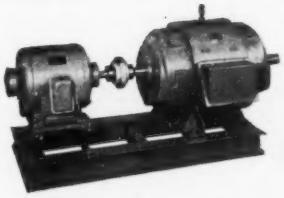
MEET NEW DEMANDS

ON OLD GENERATORS WITH

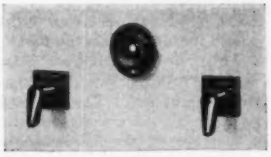


WHEN POWER DEMANDS GROW, increase your available generator capacity by increasing the safe operating limits. Install *Regulex* voltage regulators. They will automatically keep the field current high enough for stable operation — assure a safe minimum field current for any power factor load. The fast acting *Regulex* voltage regulator will also minimize the effect of system disturbances caused by sudden load changes or fault conditions.

Regulex Control is Accurate . . . Simple to Adjust and Maintain



THE MOTOR-DRIVEN *Regulex* exciter is conservatively rated for long life. Since it's similar in construction to a dc generator, the same periodic inspection routine can be followed. No special training of maintenance personnel is required.



ONLY THREE operating controls needed: (1) a control switch places regulator in and out of service; (2) a second switch controls the motor-operated main exciter field rheostat; (3) a voltage adjusting device selects proper ac regulated voltage.

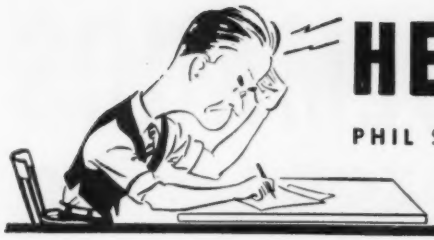
COMPONENTS of the *Regulex* voltage regulator in this cabinet have no moving parts, require no maintenance or adjustment after installation. This single control cubicle can be placed in any convenient spot or combined with switchgear equipment.

★ **You can use *Regulex* voltage regulators on alternators, synchronous condensers, and large synchronous motors. In every application, *Regulex* control gives fast response, provides accurate, sensitive voltage control. See your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.**

Regulex is an Allis-Chalmers trademark.

A-3770

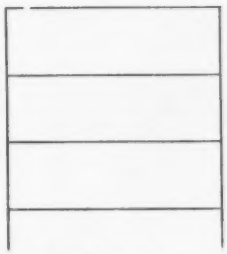
ALLIS-CHALMERS



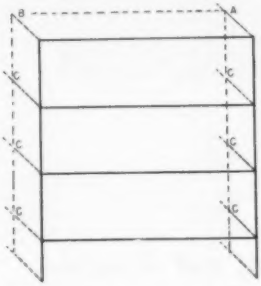
HEADWORK

PHIL SWAIN BRINGS ENGINEERING THEORY DOWN TO EARTH

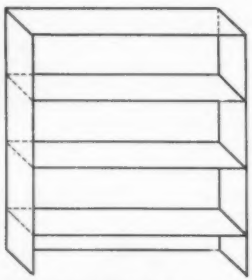
Easy Sketching System—2



1 FRONT VIEW. First draw a straight front view of the bookcase, like this



2 DEPTH LINES. From the corners of the front view, draw these dotted, slanting lines (all parallel, at any convenient angle). These represent the depth lines, that is, those perpendicular to the front. Pick point *A* (by eye) to represent back-right-upper corner. Draw horizontal line through *A*. Then *AB* is top back edge. Verticals through *A* and *B* give points *C*, all of the back corners



3 HORIZONTAL LINES. Connect the corresponding Cs by horizontal lines. You now have all edges of the bookcase. Draw solid lines for all that show. The invisible edges may be dotted or erased

► THESE LESSONS will deal mainly with "square" objects—those in which the main lines run in the three perpendicular directions.

The directions may be called height, width (as the object faces you) and depth (the horizontal lines running away from you).

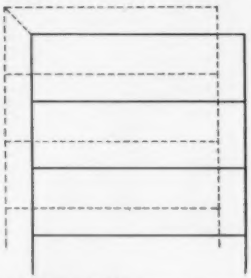
Last month, we gave two examples of true perspective. In one, the usual case, only the vertical lines in nature appeared parallel in the sketch. Both the width lines and the depth lines converged on "vanishing points" on the horizon.

The other example of true perspective showed the width lines in the object as horizontal lines in the sketch. In this form of true perspective the face of a bookcase is drawn square, just as in an ordinary mechanical drawing. Then the only lines that converge are the depth lines.

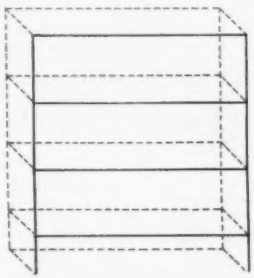
Cabinet sketching goes a step farther and shows the depth lines as parallel lines. While not quite "true to nature," this method is satisfactory for many mechanical purposes. The angle of slant can be anything that you wish.

The step-by-step sketches and captions on this page show how easy it is to draw a bookcase in this system.

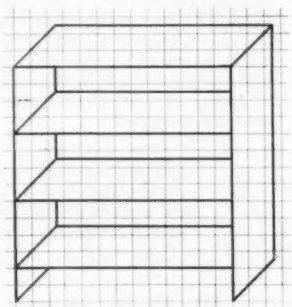
You can work with a T-square and either a 45-deg or 30-deg triangle. If these aren't handy, you can work almost as well with a straightedge on plain squared paper. In that case you use the diagonals of the squares to line up the 45-deg slant lines, as in Fig. 6.



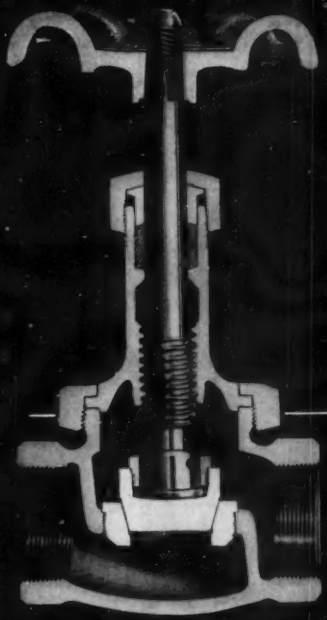
4 ANOTHER WAY to start. Draw front as in Fig. 1. Then draw the back side in dotted lines, exactly like front, but displaced diagonally, as shown here



5 COMPLETE dotted lines as shown here. Then to get a duplicate of Fig. 3, just blacken the lines that are visible



6 OR, you can work on squared paper, this way, using only a straightedge



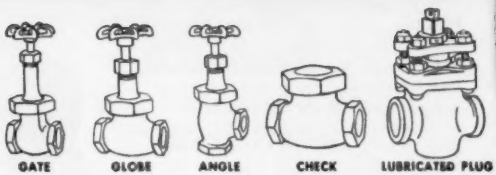
BRONZE

COMPLETE LINES OF BRONZE VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns, including Walseal® Bronze Valves and Fittings for making Silbraz® joints.

Walworth also manufactures complete lines of valves and fittings — including Lubricated Plug Valves — made of steel, iron, and special alloys as well as bronze.

Walworth-made valves, pipe fittings, and pipe wrenches, total approximately 50,000 items—all sold through distributors in principal centers throughout the world.

Walworth engineers will be glad to help you with your problems. For full information call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

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"That'll keep her running," he said, packing his tools. "She's good as new again."

The Bulldozer's Big Headache

► POWER readers are familiar wth the diesel maintenance articles by C Morgan Jones. He's worked with diesels aboard ship and ashore. Besides, Jonesey is the author of a marine engine book. So we thought an old-timer like Marmaduke Surfaceblow might appreciate another practical engineer who has knocked around this old globe a bit.

That's why we visited Marmaduke at his office above O'Houlihan's Machine Shop & Engine Works when Jonesey came in with his latest article. Before long the two of them were sailing ships and operating plants all over again.

"BILGEWATER," roared our unpredictable Marmy, when Jonesey mentioned a big Harland & Wolff diesel he had been nursemaid to in Australia. "I'll tell you about a diesel headache I cured, and I didn't have to go all the way to Australia to do it."

After that blast, Marmaduke gave his old gray bowler a 35-degree list to starboard, tilted back in his swivel chair and plopped his feet up on his roll-top desk. With thumbs stuck into the armpits of his checkered vest, he stared belligerently around, then bellowed on.

"Back in 1929 I landed at a lumber camp in the state of Washington. My job was doing maintenance work around the power plant and keeping the mill machinery going. We were on a 24-hour schedule in those boom days and I had orders to 'keep things running,' regardless of cost. And costs were plenty high.

"The plant ran smoothly enough, but the foreman in charge of portable equipment was having trouble. For one thing, a large new bulldozer was knocked out every few days by a cracked cylinder head.

"The first month I was there that bulldozer cracked four heads. The big boss admitted that work was in rough country, but he still couldn't see why the heads cracked.

" 'Sure,' he admitted to the maintenance foreman, 'she's standing on her head one minute and on her tail the next—but *four* cracked heads in *one* month. . . .'

"When the fifth head let go and the big bull again had to be yanked out of service, the boss blew a gasket. He threatened to sell every machine of that make—and he wasn't fooling.

"Because the outfit had camps all across the Northwest, the dealer got panicky. He called the manufacturer long distance. The manufacturer came to the rescue by flying out a trouble-shooter next day.

"First thing this 'expert' did was to renew the cracked head. Then he ran the bull around the place for a while and checked the engine.

" 'That'll keep her running now,' he announced. 'She's good as new.' But he gave no clue to what had been causing the cracked heads. He grabbed the next plane back home.

"That Friday this same bull, working in the same rough territory, cracked the new head that the expert put in. Another SOS went out and our friend was back on the next plane.

" 'Same head, eh?' commented the expert, scratching his head.

(Continued on page 186)

MARMADUKE SURFACEBLOW

This unusual photo of our hero (only one ever taken) was made five years ago at Bedlams Bent Propeller Bar during highly scientific discussion. He had the floor

Alligator Hide

for a Boiler Lining

THIS unusual form of calcium carbonate sludge could cause more trouble inside your boilers than a live alligator in the control room. That is why Nalco scientists deliberately cause scale and corrosion conditions in test boilers, then find the water treatment solutions for them — without subjecting Nalco System users to a "guinea-pig" role in testing new chemicals.

If your plant is not already enjoying the security of The Nalco System, ask for a water treatment survey, now. It may be the means of saving you real money on water treatment chemicals and plant maintenance.

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A 28-page, full-color trip through Nalco laboratories and plants—designed to be next best to a visit in person to the outstanding facilities and personnel Nalco puts at your disposal. Your copy sent free upon request. Write for it today.

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JENKINS PRACTICAL PIPING LAYOUTS 64

How to plan

PIPING CONNECTIONS FOR PLUMBING AND HEATING IN A SMALL TAXPAYER BUILDING

The one-story "taxpayer" building has been developed and steadily improved as a result of the movement of shopping centers to surburban areas. This type of building, which is multiplying rapidly, is constructed either with or without basement. It houses retail stores, service establishments, amusement centers, restaurants and offices.

Heat and plumbing services in such buildings are usually provided by the owner or operator, and for this reason, he must give careful consideration to low cost and trouble-free installations. An oil or gas fired steam boiler with automatic control, and a separate gas fired heater for hot water supply, as illustrated in the accompanying diagram, will generally meet these requirements.

The two-pipe heating system, located in the basement in the installation illustrated, utilizes unit heaters with individual thermostatic controls. Valuable extra floor space is made available for tenants' use because the heaters are hung from the ceiling. Since the heaters in each store or each section of a store are automatically controlled, fuel savings are effected and even heating is assured.

A further refinement of the control system would include an automatic shutoff or modulating valve on the steam line just ahead of each unit heater and an aquastat in the condensate return line from each heater.

Piping is simple in the installation illustrated, and valves are of the standard type for cold and hot water, steam, and condensate carried in the system.

The Jenkins Fig. 108-A Bronze Angle Valve recommended in this hookup for boiler fill and level control shutoff is the Renewable Composition Disc type. It provides vapor-tight closure and after long use, can be restored to new-like operating condition by simply slipping on a holder containing a new composition disc. This valve is one of the popular Jenkins 106-A Series, which is fully described in the folder offered.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering experience, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17. Sold through leading Industrial Distributors everywhere.

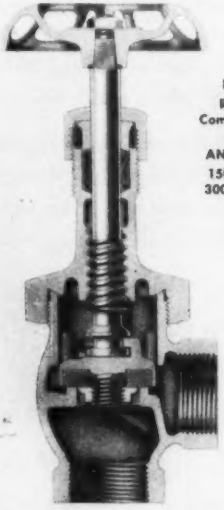

Fig. 108-A
Renewable
Composition Disc
BRONZE
ANGLE VALVE
150 lbs. Steam
300 lbs. O.W.G.

SEND FOR THIS FOLDER It illustrates and describes the Jenkins Fig. 106-A Valve series, which provides valve combinations for 90% of industrial piping with four bodies and a handful of parts, and tells why Fig. 106-A is industry's favorite for long range economy. Fill out and mail the coupon today.

JENKINS BROS., 100 Park Avenue, New York 17, N. Y.

Please send folder on Fig. 106-A Series

Name _____

Company _____

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Illustrating the proved 3-point formula for trouble-free, time-defying hookups

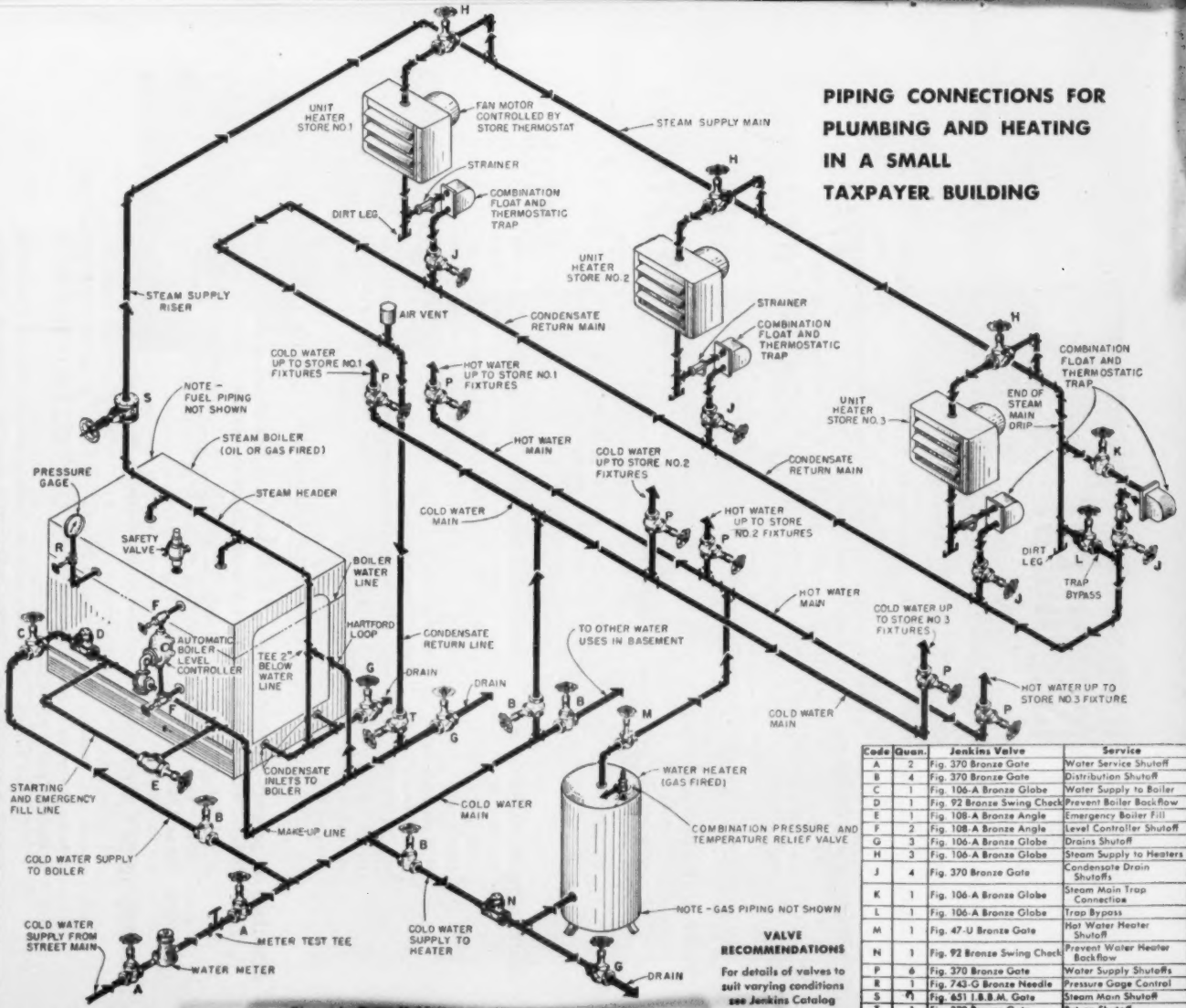
A Use the right type valve for the service

B Place valves correctly in the line

C Choose Jenkins for lifetime economy

JENKINS VALVES
LOOK FOR THE DIAMOND MARK
SINCE 1864
JENKINS TRADE MARK

PIPING CONNECTIONS FOR PLUMBING AND HEATING IN A SMALL TAXPAYER BUILDING


UNIT HEATER STORE NO.1
FAN MOTOR CONTROLLED BY STORE THERMOSTAT
STEAM SUPPLY MAIN
STRAINER
COMBINATION FLOAT AND THERMOSTATIC TRAP
DIRT LEG
UNIT HEATER STORE NO.2
STEAM SUPPLY RISER
AIR VENT
CONDENSATE RETURN MAIN
COLD WATER UP TO STORE NO.1 FIXTURES
HOT WATER UP TO STORE NO.1 FIXTURES
NOTE - FUEL PIPING NOT SHOWN
STEAM BOILER (OIL OR GAS FIRED)
HOT WATER MAIN
COLD WATER UP TO STORE NO.2 FIXTURES
UNIT HEATER STORE NO.3
END OF STEAM MAIN DRIP
PRESSURE GAGE
STEAM HEADER
HOT WATER UP TO STORE NO.2 FIXTURES
SAFETY VALVE
BOILER WATER LINE
DIRT LEG
TRAP BYPASS
HARTFORD LOOP
CONDENSATE RETURN LINE
AUTOMATIC BOILER LEVEL CONTROLLER
TEE 2" BELOW WATER LINE
TO OTHER WATER USES IN BASEMENT
COLD WATER UP TO STORE NO.3 FIXTURES
DRAIN
HOT WATER UP TO STORE NO.3 FIXTURE
COLD WATER MAIN
STARTING AND EMERGENCY FILL LINE
WATER HEATER (GAS FIRED)
MAKE-UP LINE
COLD WATER SUPPLY TO BOILER
COMBINATION PRESSURE AND TEMPERATURE RELIEF VALVE
NOTE - GAS PIPING NOT SHOWN
COLD WATER SUPPLY FROM STREET MAIN
METER TEST TEE
COLD WATER SUPPLY TO HEATER
WATER METER

Code	Quan.	Jenkins Valve	Service
A	2	Fig. 370 Bronze Gate	Water Service Shutoff
B	4	Fig. 370 Bronze Gate	Distribution Shutoff
C	1	Fig. 106-A Bronze Globe	Water Supply to Boiler
D	1	Fig. 92 Bronze Swing Check	Prevent Boiler Backflow
E	1	Fig. 108-A Bronze Angle	Emergency Boiler Fill
F	2	Fig. 108-A Bronze Angle	Level Controller Shutoff
G	3	Fig. 106-A Bronze Globe	Drains Shutoff
H	3	Fig. 106-A Bronze Globe	Steam Supply to Heaters
J	4	Fig. 370 Bronze Gate	Condensate Drain Shutoffs
K	1	Fig. 106-A Bronze Globe	Steam Main Trap Connection
L	1	Fig. 106-A Bronze Globe	Trap Bypass
M	1	Fig. 47-U Bronze Gate	Hot Water Heater Shutoff
N	1	Fig. 92 Bronze Swing Check	Prevent Water Heater Backflow
P	6	Fig. 370 Bronze Gate	Water Supply Shutoffs
R	1	Fig. 743-G Bronze Needle	Pressure Gage Control
S	1	Fig. 651 I.B.B.M. Gate	Steam Main Shutoff
T	1	Fig. 370 Bronze Gate	Return Shutoff

VALVE RECOMMENDATIONS

For details of valves to suit varying conditions see Jenkins Catalog

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Diagram by Robert McKenzie
Consulting Engineer

DEFENSE DIGEST

Your roundup of mobilization news and trends affecting power men

Enlarged power-expansion program calls for 41 million kw to be added during the years 1952-1955, plus a million kw already scheduled for 1956. It was recommended to Defense Production Authority by James F Fairman, administrator of the Defense Electric Power Administration. Principal difference from previously announced goals (Defense Digest, May 1952) is somewhat heavier weight on later part of period covered. The current year is now down for 7 million kw, with 10 million for 1953, and 12 million each for 1954 and 1955.

The million additional kw for 1956 merely covers certain specific defense loads; no over-all 1956 goal has yet been established.

More aluminum and copper make it possible to permit formerly prohibited uses and boost allotment percentages. Data showing that these metals are in approximate balance with defense and essential civilian demand appear in Issue No. 8 of DPA's "List of Basic Materials and Alternates." For copper, full allotments for most civilian uses might come as early as second quarter 1953. Aluminum is expected to be in easy supply by January 1954, despite delays in new facilities.

Shortages of water caused work stoppages in several defense plants recently, it was revealed by the year-old Water Resources Division of NPA. In one case, three breaks in a Wichita, Kansas, water main caused layoff of more than 50,000 aircraft workers. In another, NPA is taking action to help Oklahoma City get 10,000 ft of pipe needed to tap another supply to supplement the one now threatened by lack of rainfall in the Canadian River watershed.

Right now, in the wake of the steel strike, materials can be allocated only to (1) restoration of disaster-damaged water and sewage systems (2) construction needed for public health and epidemic prevention (3) construction for military and atomic-energy installations. As soon as steel supply permits, NPA will expand its allotments of critical materials for pollution-control projects.

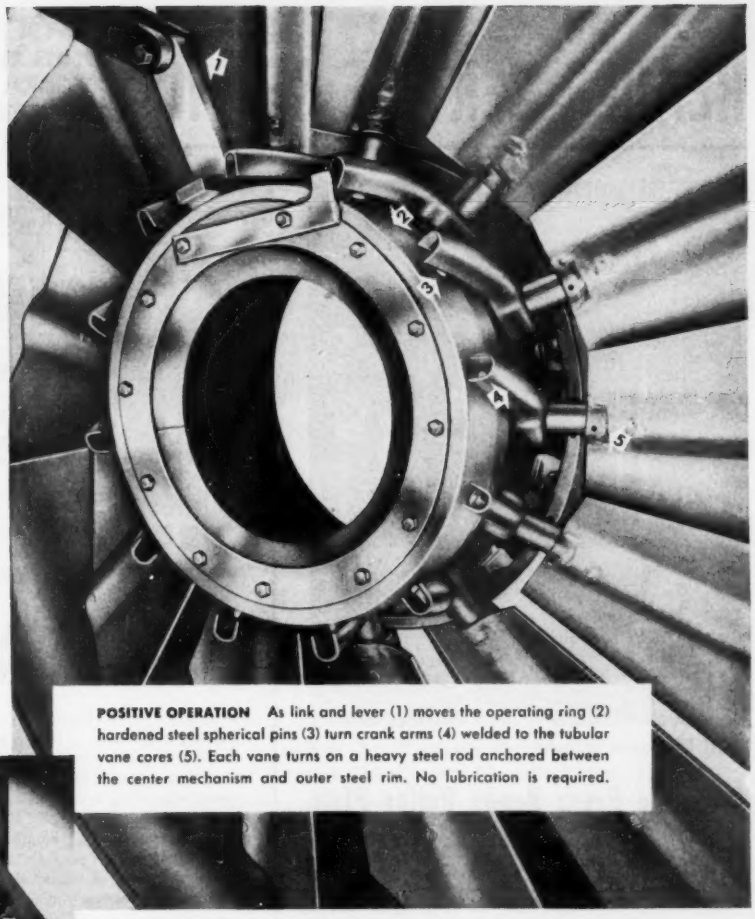
Checkup on power-job progress is under way to assess effects of delaying factors, such as continued tightness of certain items and results of the steel strike. DEPA has asked electric utilities to supply, by Oct 1, needed information on "in-service" dates of all generating units scheduled for commercial operation before 1955.

Control-agency shrinking continues in Washington, with industry people leaving and career men from regular agencies taking over. NPA will go back under full control of Commerce Dept. After Jan 1 its main job will be to keep in touch with industry, be ready to set up controls again if needed. DPA will largely switch to post-mobilization planning.

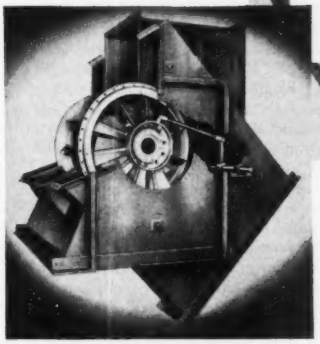
To see current NPA setup, look at handy guide in Defense Production Record. It lists administrators of M-Orders, NPA and CMP regulations. To get a copy of this issue (8/14/52) write Supt. of Documents, Washington 25, D. C. and enclose 5¢.

This winter's oil supply should be adequate despite delays in bringing in new production, refining and storage capacity. Unless the weather is markedly colder than normal, there should be no over-all shortage. But possibility of local shortages remains, particularly on the East Coast and in the Pacific Northwest.

SAVE POWER WITH CONSTANT SPEED MOTORS



POSITIVE OPERATION As link and lever (1) moves the operating ring (2) hardened steel spherical pins (3) turn crank arms (4) welded to the tubular vane cores (5). Each vane turns on a heavy steel rod anchored between the center mechanism and outer steel rim. No lubrication is required.



Operating mechanism is shielded from the gas stream but is readily accessible from the outside for inspection and maintenance.

VANE CONTROL

CAN SAVE BOTH FIRST COST AND OPERATING COST

The combination of Sturtevant Vane Control and the simple squirrel cage motor is less costly to install and provides greater overall power savings than other types of mechanical draft control. These savings are made possible by simplified design.

Vane Control has no gears—no backlash. It provides instantaneous control of draft. The vanes move rapidly in the open range, yet fine adjustment is possible in the near-closed position. Extremes of heat and cold do not affect its operation.

In any comparison of fans and their control mechanisms for use in mechanical draft, as well as industrial applications and ventilating service, you will find Vane Control is both the most efficient and the most economical choice. For full information ask for Folder DB-92-810. Contact your local Westinghouse-Sturtevant office, or write Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

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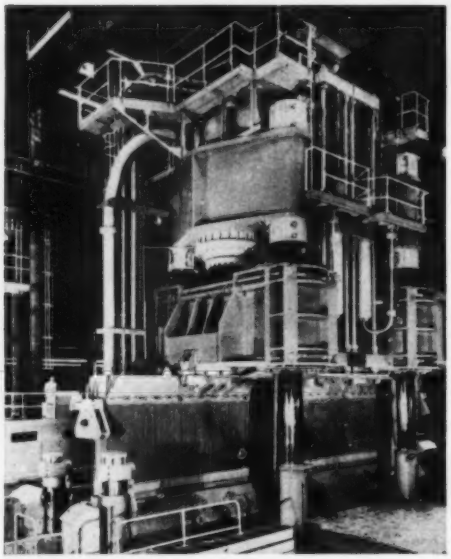


GIANT PRESS can bend plates as long as 42 ft or more

Hydraulic Press Bends Boiler Plate

► NEWEST ADDITIONS to Babcock & Wilcox Co's $30-million expansion program are a 64-ft high, 6500-ton hydraulic plate-bending press (photo above), and a companion horizontal draw press (not shown) at the company's Boiler Div at Barberton, Ohio.

The press bends heavy plate for boiler drums and also serves to pierce ingots that can be transferred to the draw bench for forming into hollow forgings for boiler headers and other parts.

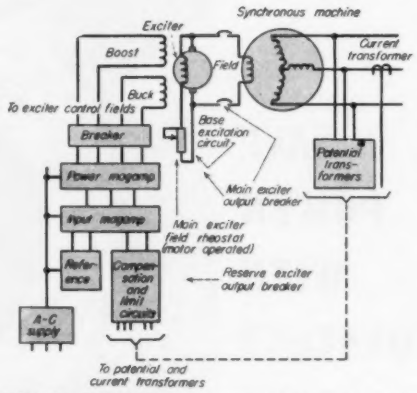
Operating pressure reaches 3000 psi on the press which has a daylight of 20 ft and an operating stroke of 9 ft 6 in. Bending beams are 42 ft long. The open-end design allows handling even longer plates.

This ability to handle longer plates saves on boiler drum fabrication costs. Fewer welds mean less fabricating time and lower cost.

The 114-ft overall length, horizontal draw bench has a 1200-ton rating. Return stroke operates at 600 tons pressure and the 30-ft long stroke forward works under either 600 or 1200 tons pressure. Hollow ingots leaving the hydraulic press are drawn through a series of ring dies over a mandrel on the draw bench to form a rough, hollow forging in a few minutes.

Seamless hollow forgings from a minimum of 8 in. i.d. and $\frac{3}{4}$ in. wall thickness up to a top of 26 in. i.d. and $4\frac{1}{2}$ in. wall thickness in lengths up to 22 ft can come off this draw bench.

For **Coming Events** *turn to page 216*



SIMPLIFIED SCHEMATIC of Magamp high-speed regulator

Static Voltage System Regulates Synchronous Machines

► AIMING TO (1) eliminate maintenance associated with rotating amplifiers, (2) increase speed of response, (3) produce a voltage regulating system with "ideal" damping, Westinghouse Electric Corp has developed a high-speed regulating system using magnetic amplifiers.

The magnetic amplifier *(Magamp)* has a shorter time delay than a rotating amplifier, and when used with a self-excited exciter, provides a regulating system that has faster response. A static device, the *Magamp*, shown schematically above, replaces the rotating amplifier and eliminates its brushes and commutator. The result is a fast, reliable system requiring little or no maintenance. Basic elements are the same for any type of synchronous machine, so this regulator can be used with turbine generators, waterwheel generators, or synchronous condensers.

The synchronous machine has a self-excited main exciter; manual control of excitation is accomplished by adjusting the motor-operated field rheostat.

The main exciter has two separately-excited control fields that are energized by the power *Magamp*. Under regulator control, the motor-operated main exciter field rheostat is set manually to produce a base excitation for the synchronous machine. The power *Magamp* puts energy into either the boost or buck control field to raise or lower the excitation voltage to maintain a fixed machine terminal votage.

The self-excited field and separately-excited control fields regulate the exciter voltage. Loss of the separate excitation does not seriously disturb the main unit under normal conditions. Operation continues with the excitation provided by the self-excited fields, as under manual control. Using separate fields to provide the buck-boost energy eliminates switching in the self-excited field circuit to change from manual to automatic control.

More **Power News** *on page 208*

CUT MAINTENANCE COSTS...

TUBE...OR RETUBE...WITH *Electrunite* heat exchanger tubes

You'll cut the annual cost of maintaining heat exchangers when you do the job with ELECTRUNITE Heat Exchanger Tubes . . . the electrically-welded steel tubes that add years to the life of process equipment.

Uniform diameters, inside and outside, assure trouble-free insertion and roller expansion of tubes, and reduce danger of weepers. Uniform structure assures predictable strength even under severe vibration and stress. Freedom from slivers and scabs prevents localized attack and poor roller expansion into the tube sheets.

Let us send you information on ELECTRUNITE Heat Exchanger Tubes for boilers, heat exchangers, and pressure applications of all types.

SEE US AT
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NEW YORK
DECEMBER 1—6

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st STREET • CLEVELAND 8, OHIO

Made by the manufacturers of ELECTRUNITE *Boiler Tubes . . . the* original *electric-resistance-welded pressure tubes.*

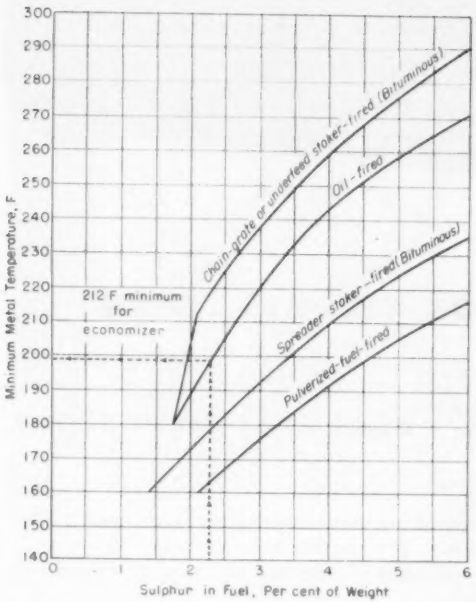
REPUBLIC STEEL
ELECTRUNITE

TECHNICAL BRIEFS

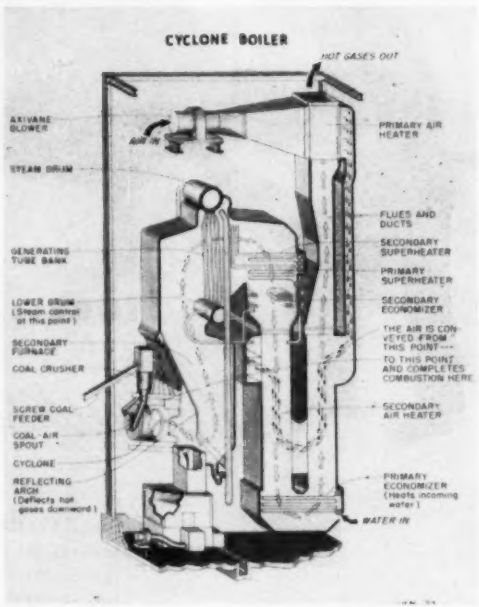
Latest engineering developments for busy power men

10 Digests for you on:

FUELS AND FIRING
EMPLOYEE TRAINING
AIR POLLUTION



1 Sulfur in flue gas corrodes boiler surfaces. Chart shows recommended minimum temperatures for economizer-control



2 Education of power plant help, growing management concern, employs visual aids like drawing above for boiler studies

Fuels and Firing

Influence of Coal Properties on Performance. *By B E Tate, National Cash Register Co.*

Too often coal is sold and bought on the basis of cost per million Btu delivered in the bunkers. Coal cost is but *one* of a number of important properties that must be jointly considered in selecting coal for industrial use.

Premium payments of 15 or 20%, more than a dollar per ton of coal, are common, and sometimes quite necessary to obtain the lowest operating cost. How long that condition should continue is another question but that it does exist in a great many boiler plants is undisputable.

Other properties to be considered include: size-consist (including uniformity of size-consist), tendency to swell, grindability, moisture and ash content, ash fusing temperature, sulfur content. (See Fig. 1).

Savings in operating cost are not the only benefits from considering these other properties of coals. Many operating difficulties for both the boiler plant and the factory as a whole may be avoided. During the past decade industrialization of U. S. towns and cities has made great progress. But the public has been subjected to increased air-pollution nuisances, and stringent air pollution ordinances have been put into operation in many places.

While writing this article, the author visited three boiler plants using specially-prepared premium-priced coals to satisfy neighborhood complaints of fly ash. One has a spreader stoker, one an underfeed stoker and the other traveling-grate stokers. Two of them were facing law suits for the nuisances made prior to using premium coals. All were satisfying their neighborhoods with their special coals.

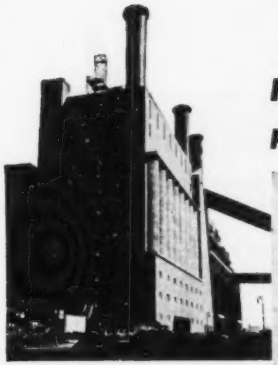
The paper discusses the role of individual coal properties in some detail. *ASME paper. No. 52-SA-54.*

Comparing Performance of Combustion Chambers. *By J B Nichols, General Electric Co.*

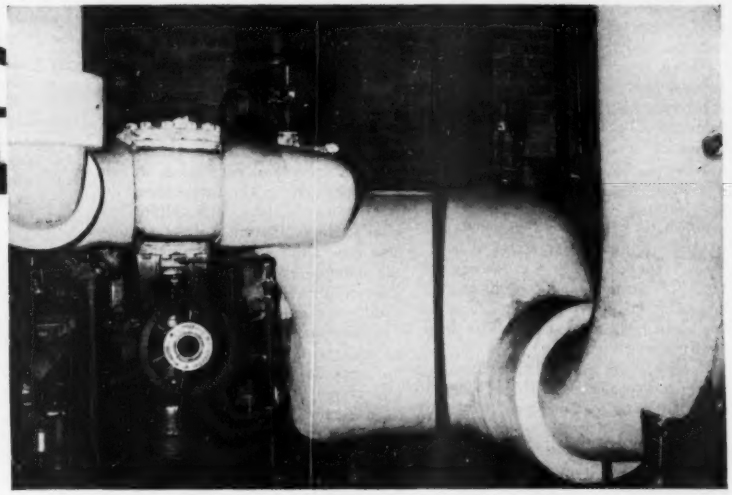
The quality of a combustion chamber is usually defined by combustion efficiency, or the energy represented by air temperature rise compared to heating value of the fuel.

If temperature rise is the only desired result of combustion, then the combustion efficiency is the only important parameter.

In general, however, the purpose of a combustion chamber is to take in air with a certain energy and deliver this air with a higher energy to a nozzle for expansion, where it provides thrust directly or operates a turbine. For these applications, pressure drops cause de-



For this new addition to their New York City power plant at East River and 14th Street . . .



(Above) View of recently completed annex to Consolidated Edison's power plant . . . another link in their gigantic expansion program. **(Right)** Close-up of J-M 85% Magnesia Insulation on boiler feed lines. It was expertly installed by the Asbestos Construction Company, Inc., an outstanding J-M Insulation Contractor.

CON EDISON SPECIFIES J-M 85% MAGNESIA PIPE INSULATION FOR MAXIMUM FUEL SAVINGS

Like all materials that went into the new power plant addition of New York's leading gas and electric supplier . . . the pipe insulation had to be the *best*. That's why Consolidated Edison Co. specified J-M 85% Magnesia . . . industry's No. 1 insulation for many decades and *still* the leader in its class.

J-M 85% Magnesia is the leading insulation on the market for temperatures up to 600F. It is bonded with asbestos fibers. This rugged insulation will not distort regardless of the length of time it stays in service. J-M 85% Magnesia fits snug and stays put. Heat savings, therefore, remain constant for the life of the equipment on which this insulation is applied.

For temperatures over 600F, J-M 85% Magnesia is used in combination with Superex*, a J-M insulation for service to 1900F. This double-layer construction, known as Superex Combination, eliminates through joints and protects the jacket against scorching. It also utilizes the higher heat resistance of Superex next to the hot surface, and the greater insulating value of J-M 85% Magnesia for the outer layer.

*Reg. U.S. Pat. Off.

Experience has proved that all insulations must be properly installed to pay maximum dividends. That's why Johns-Manville offers industry the services of experienced insulation engineers and installation contractors who have made a career of solving complex insulation problems. From coast to coast, these engineers and the contractor's highly skilled mechanics stand ready to combine their talents and give you an insulation job that will more than pay off your initial investment with maximum fuel savings through the years.

When you face your next insulating problem . . . remember that Johns-Manville is "Insulation Headquarters." Consult your near-by J-M Insulation Contractor . . . or write direct to Johns-Manville, Box 60, New York 16, New York. In Canada, write 199 Bay Street, Toronto 1, Ontario.

Skilled Applicators on the team of a J-M Insulation Contractor applying J-M 85% Magnesia to pipelines. Located throughout the nation, these contractors have had years of experience handling all types of installations. They know J-M 85% Magnesia and other J-M insulations as *quality* products, and take pride in applying them properly. Result: an insulation job that pays dividends through the years in maximum fuel savings.

Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION

creases in available energy comparable to those due to combustion inefficiencies, and, therefore, should be included in any parameter that describes actual worth of the combustion chamber.

There is no doubt that an energy concept must finally be used in comparing combustion chambers. To give a combustion chamber an energy efficiency of, say, 90%, tells exactly how good it is; while to give a combustion efficiency without also mentioning pressure drop is of far less value. Even given both combustion efficiency and pressure drop, the comparison of burners is vague, since energy is the desired result of burning and it is difficult to mentally weigh the relative effects of combustion efficiency and pressure drop on the over-all energy.

Energy loss in a combustion chamber, due to pressure drop, is generally more important than loss due to combustion inefficiency. So it must be included in any parameter that claims to state the burner efficiency. Combustion efficiency alone does not serve this purpose. A method of comparison on an over-all energy basis is suggested and developed. By this method, any combustion chamber is assigned a single energy efficiency that includes the effects of both combustion efficiency and pressure drop. *ASME paper. No. 52-SA-37.*

Burner Oscillations of the Organ-Pipe Type. *By A A Putnam and W R Dennis, Battelle Memorial Institute.*

Acoustical oscillations are frequently generated when a flame is partially or totally confined in a combustion chamber. These oscillations may not only become undesirable from a nuisance or physiological standpoint, but may at times become so violent as to blow out the flame or even destroy the equipment. They normally increase heat transfer; this may be beneficial, but uncontrolled increases in heat flux may melt the burner walls. On the other hand, oscillations may lead to improved flame holding, yielding operating ranges greater than those obtained with conventional flame-holding techniques; they also may cause increased mixing, leading to higher combustion efficiency without greater residence time in the burner. Therefore investigating oscillations should furnish important information for optimum burner design.

Three simplified combustion systems have been investigated for acoustical oscillations. These are: (1) a mixing chamber and multiple-port burner mounted in a combustion tube open at both ends; (2) a similar mixing chamber and multiple-port burner that completely blocks the secondary-air inlet of the combustion tube; and (3) a system similar to (2) but using separate fuel and primary-air inlets, giving a diffusion flame rather than a premixed-gas flame. Oscillations occurred only for certain ranges of the variables. In the first system, the pitch differed significantly in adjacent ranges of oscillation. In the two latter systems, the frequency of the oscillations remained fairly uniform and close to the fundamental of the combustion tube although breaks occurred in the data as the configurations of the inlet supply systems were varied. These results are explained on the basis of (1) the time of feedback of pressure pulses that ultimately cause changes in the heat-release rate, and (2) the location of the flame relative to a section of maximum pressure amplitude in the combustion tube. An appendix presents a thermodynamic treatment of the phase requirement between rate of heat release and pressure. *ASME paper. No. 52-SA-12.*

TO OBTAIN COMPLETE TEXT

Material for these abstracts comes from the following sources unless otherwise stated. Order complete paper from source not POWER.

American Society for Testing Materials, annual meeting, Statler Hotel, New York, N. Y. June 23-27, 1952. Identified by initials ASTM. Available through ASTM, 1916 Race St, Philadelphia 3, Pa.

American Society of Mechanical Engineers, Oil and Gas Power Div, Statler Hotel, Buffalo, N. Y. June 23-27, 1952, identified by initials ASME, OGP; Semi-annual meeting, Sheraton Gibson Hotel, Cincinnati, Ohio, June 15-19, 1952, identified by initials ASME, SA. Obtainable through ASME, 29 W 39th St, New York 18, N. Y.

Air Pollution and Smoke Prevention Assn of America, annual meeting, Statler Hotel, Cleveland, Ohio, June 8-13. Identified by initials APSPAA and obtainable in official Proceedings to be published through APSPAA secretary Griebling, Mellon Institute, Pittsburgh, Pa.

Employee Training

Training Operating Personnel for Power Plants. *By D F Steine, Dow Chemical Co.*

In setting up a training program for power plant personnel, Dow Chemical Co realized that a vast amount of cooperation would be required from the management, the working man, the various educational departments and the local union. They decided that an educational committee from upper management could best meet this requirement. After considerable consultation a program was planned. It incorporated the following policies:

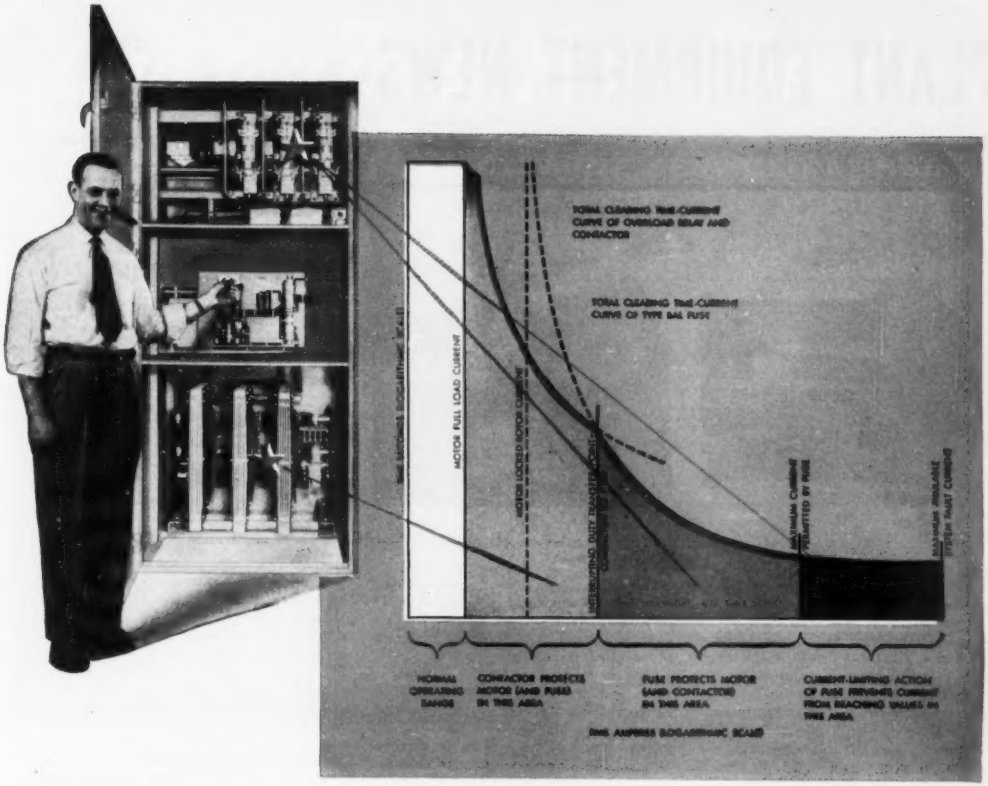
1. The courses should pertain as closely as possible to Dow problems and equipment, except those that were highly technical, like electricity and instruments. (See Fig. 2.)
2. The first to take the course would be selected by seniority; later groups would be those requiring such training.
3. The plan would start modestly with one firing course that was most needed; later the curriculum would interest engineers, instrument, maintenance and laboratory men.
4. The first instruction was to be planned and given by a member of the power dept management.

The program was a step in the right direction. However, the time required was more than anyone within the power dept could spare. After further study, the committee decided to hire someone outside to carry on this project as a part time program. But after several short attempts using other than power personnel, they found that the courses as well as the classes were too limited. Also, they believed that a more successful program could be carried on if a full time instructor were employed. In addition, it was agreed between the educational dept and the committee that the educational dept would correct all papers to eliminate any implication of favoritism. *ASME paper. No. 52-SA-46.*

Training Power Plant Employees. *By A H Beiler and J E Gene, American Gas and Electric Service Corp.*

Before initiating a training program, we held a meeting of all our power plant superintendents to exchange views and decide upon the best approach. The conclusion was that there should be two types of instruction: (1) descriptions of the equipment and how it operates; (2) specific instructions telling a man what

(*Continued on page* 196)


TOTAL CLEARING TIME-CURRENT CURVE OF OVERLOAD RELAY AND CONTACTOR
TOTAL CLEARING TIME-CURRENT CURVE OF TYPE BAL FUSE
MOTOR FULL LOAD CURRENT
MOTOR LOCKED ROTOR CURRENT
MAXIMUM CURRENT PERMITTED BY FUSE
MAXIMUM AVAILABLE SYSTEM FAULT CURRENT
NORMAL OPERATING RANGE
CONTACTOR PROTECTS MOTOR (AND FUSE) IN THIS AREA
FUSE PROTECTS MOTOR (AND CONTACTOR) IN THIS AREA
CURRENT-LIMITING ACTION OF FUSE PREVENTS CURRENT FROM REACHING VALUES IN THIS AREA

This co-ordinated protection safeguards men, motors and circuits

Men? Motors? Circuits? Which can be ignored at a high-voltage motor installation? Obviously, NONE. Yet, high-voltage protective equipment is often installed that DOES NOT safeguard all three.

Protection must be co-ordinated to be complete. It must safeguard all elements under all conditions. Examine the above chart and note how a Westinghouse High-Voltage Combination Starter co-ordinates fuses and contactor to provide continuous protection for both motors and circuits. Note how the sectionalized steel cabinet protects personnel and equipment.

Co-ordinated protection also safeguards production. No chance for high current faults to bypass the starter and damage equipment. Down time is confined to correcting the fault and then reclosing the circuit.

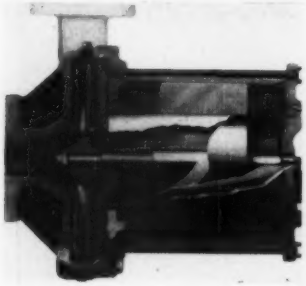
The advantages of Westinghouse Co-ordinated Protection are many. Talk them over with your Westinghouse representative. Or, write for booklet B-4673 "High-Voltage Motor Starters". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-27029

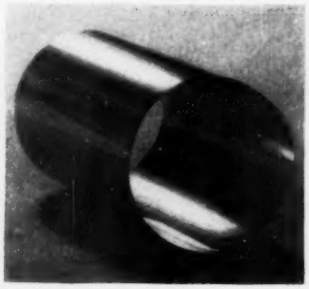
YOU CAN BE SURE... IF IT'S
Westinghouse
HIGH VOLTAGE STARTERS

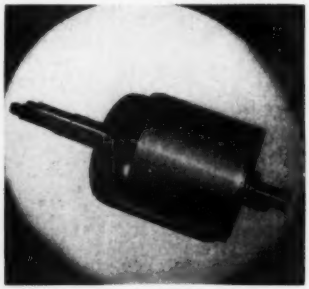
PLANT EQUIPMENT NEWS

Your information center for new products designed to solve plant problems

Published monthly as a service to readers







Chemical Pumps Eliminate All Seals and Stuffing Boxes

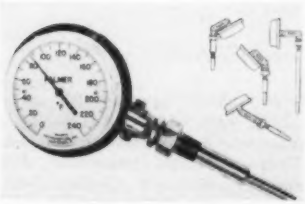
P1008 • Combined motor-pump design has eliminated all mechanical seals and stuffing boxes from new centrifugal chemical pump. According to the manufacturer, this step will cut out the 90% of conventional centrifugal pump maintenance that can be traced to packings and seals. Designated the *Chempump*, it is currently available in 1, 2 and 3 hp, 1750 rpm, with 2-in. intake and 1½-in. discharge openings. Capacities for each are: (1) C-1, 90 gpm at 20 ft head to 10 gpm at 48 ft head, (2) C-2, 118 gpm at 25 ft head to 20 gpm at 68 ft head, (3) C-3, 135 gpm at 40 ft head to 20 gpm at 85 ft head.

Elimination of packings and seals is achieved by: (1) inserting a non-corrosive, non-magnetic and electrically-resistant stainless-steel cylinder in the air gap between rotor and stator, (2) "canning" the rotor in a sealed stainless-steel jacket, (3) allowing the fluid pumped to run through the rotor portion of the motor, thus acting as the coolant. To keep coolant flowing, a line from the high pressure side of pump injects fluid into rotor chamber at about 15 gph. Fluid circulates through chamber, re-enters pump at center rear of impeller, through shaft clearance space.

Increase in air gap to allow cylinder insert cuts motor efficiency about 50 watts on the 3 hp model, yet net effect is marked gain over frictional losses from seals and packing on conventional centrifugal pumps.

Entire motor is encased in a rigid cast-iron sheath secured by longitudinal bolts for complete alignment with the pump casing. Stator portion is sealed from rotor chamber by *Teflon* O-rings at either end of stainless-steel cylinder. Bearings are self-lubricating sleeve type of hard, long-wearing molded graphite, constructed with adequate thrust areas so unit can operate in any position. These bearing assemblies can be removed and inserted by hand without special tools.

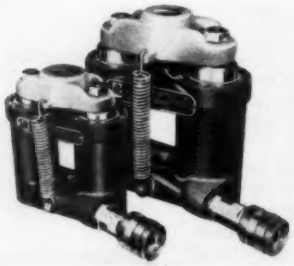
Chempump Corp, 1300 E Mermaid Lane, Philadelphia 18, Pa.



Dial Thermometer

P1014 • Mercury actuated dial thermometer has stem that can be placed at any angle and case that can be rotated to any readable position. Unit suitable for difficult positions and locations, is accurate to 1 scale division.

Palmer Thermometers Inc, 2515 Norwood Ave, Cincinnati 12, Ohio



Hydraulic Ram

P1040 • Industrial maintenance jobs requiring heavy milling or installing can use new 30-ton *Power Twin* hydraulic ram with center-hole construction. Device weighs only 23 lb, works in any position, is fully adjustable and eliminates torque problems. Unit works off a special pump. **Owatonna Tool Co, 378 Cedar St, Owatonna, Minn.**

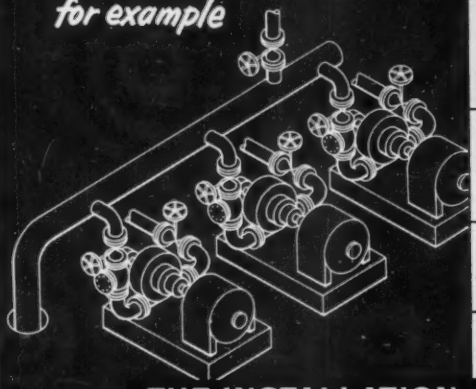
Refractory Fiber

P1009 • Expected to replace natural asbestos in many uses, *Fiberfrax* retains its properties up to 2300 F and does not soften under temperatures approaching 3000 F. It is made by melting aluminum oxide and silica in an electric furnace, then subjecting a stream of the molten material to a blast of air. The result is a fluffy, white, cotton-like mass made up of random arrangements of extremely fine fibers. As blown, the fiber weighs about 2 lb per cu ft. When packed to a 6 lb per cu ft density, it will fill the same volume as 14.6 lb of high grade refractory insulating brick

For more data on these items, use post cards, p163. Identify request with P and number.

Can You Trust Your Checks to Hold Like This?

...on Water Pumps, for example



THE INSTALLATION

Crane Iron Body Swing Check Valves in 8-inch vertical lines on discharge side of water pumps supplying a large eastern paper mill.

VALVE SERVICE RATINGS

SUITABILITY:	Working smoothly - no complaints
FEATURES:	O.K. for either horizontal or upward flow
MAINTENANCE COST:	None - no maintenance needed to date
SERVICE LIFE:	Now better than other checks used
OPERATING RESULTS:	No water or head loss
PRICE:	In line with other makes
AVAILABILITY:	Stock item - Crane product

THE HISTORY

The mill depends on these pumps for all water. Loss of head at the pumps would create a serious problem. The mill could take no such risks. Regularly, the check valves on pumps were replaced, but only to be found leaking between pumping cycles, a few months later.

It's now more than a year since the change-over was made to Crane Check Valves. There's been no loss of water, no maintenance or replacement of any checks on the pumps. That was proof enough for the mill, that Crane Quality means better valves —greater dependability and bigger value. As a result, 3 more of these checks were installed on a separate battery of suction pumps.

THE VALVE

Crane No. 373, 125-Pound Iron Body Swing Check Valves, brass trimmed. The long life and high seating efficiency of these checks, in 2 to 8-in. sizes, is in large part due to the Crane patented flexible disc-hinge design. Double spring mounting eliminates lost motion between parts, yet permits true, full contact of disc and seat at every closure. Also serves to absorb the shock of seating under backflow pressure. See your Crane Catalog or Crane Representative for full details.

The Complete Crane Line Meets All Valve Needs. That's Why

More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

More EQUIPMENT NEWS

Begins on page 154

and furnish the insulating efficiency of 20.9 lb of the brick.

Possible applications include: loose or bonded insulation for furnaces, pipe wrapping, filtering gases, fire curtains or packings, flame filters to remove ash, strengthening of electrical insulators. Fiber has a high electrical resistance.

Carborundum Co, Niagara Falls, N. Y.

Maintenance Instrument

P1041 • Model 102 circuit tester, with dc ranges of 1-5-25-125-250-500 v, 1-10-50 mils, and ac ranges of 5-25-125-250-500 v, .25-1-5-25 amp, 0-1000 ohms, 0-1 megohm, is suited for general electrical testing.

Model 247 power circuit analyzer, with ranges of 150-300-600 v, 5-25-125 amp, and 0.6 to 60 kw, is suited for locating unbalanced loads, overloaded, low power factor, and excessive circuit voltage drop. May be used on single phase 2- and 3-wire, three phase 3- and 4-wire networks or two phase systems.

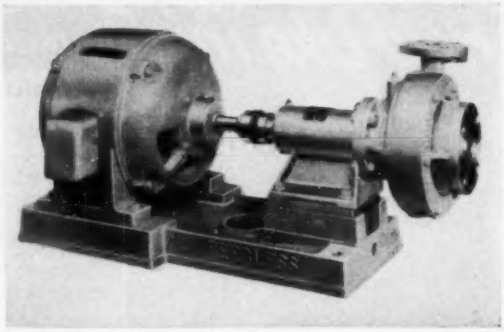
Instrument Laboratories, 315 W Walton St, Chicago 10, Ill.

Vacuum Cleaner

P1042 • Outstanding features of *Alaco* commercial vacuum cleaner are: (1) powerful suction produced by 1 hp motor and series of fans, (2) compact, durable design and light weight, (3) quiet operation, (4) tools for every purpose, (5) ability to handle both liquids and dry material, (6) low cost.

The Ace Co, 112 W Washington St, PO Box 1212, Ocala, Fla.

For more data on these items, use post cards, p163. Identify request with P and number.



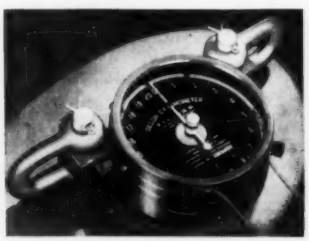
Chemical Transfer Pump Has Mechanical Shaft Seal

P1020 • Mechanical shaft seal with stainless-steel alloy for the wetted end replaces usual stuffing box on new chemical transfer pump. Available for continuous or intermittent duty, type CTB will handle acids, bases, salts, organic and inorganic solutions of all concentrations.

Pump characteristics include horizontal end-suction, top discharge design with a vertically split case. Built in four sizes, capacity range is from 10 to 250 gpm, head range 10 to 140 ft, hp range 1 to 10. It can handle liquids up to 250 F. Unit has cast iron frame and a liquid end of No. 20 stainless-steel alloy with approximately 50% chrome-nickel content.

Pump uses semi-open type impeller, with repelling vanes cast on back of impeller shroud. Repelling vanes assure maximum slurry and abrasive-handling capacity by agitating solids into center of stream flow. No wear rings are necessary. Bulletin B-1606.

Peerless Pump Div, Food Machinery & Chemical Corp, 301 W Ave 26, Los Angeles 31, Calif.

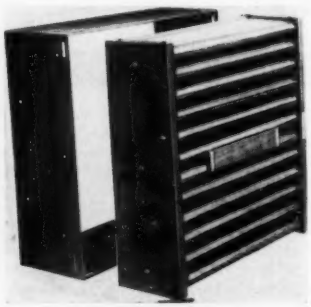


Indicating Dynamometer

P1001 • Model EL traction dynamometer operates electrical warning signals, relays, motors, switches. It can be set for any loading point between 0 and 100,000 lbs. Adjustable blue hand holds one contact at any load desired. As load is imposed, white pointer moves forward until it reaches desired point thereby closing contact with blue hand.

Typical uses are in automatic batching machines, warning signals to prevent overloading of cranes or hoists, static load testing of aircraft assemblies, remote indication of loads, etc. Device does not depend upon springs but works on principle of deflecting a calibrated beam. It is not affected by extreme temperature changes.

W C Dillon & Co, Inc, 1421 S Circle Ave, Forest Park, Ill.



Air-Recovery Cell

P1043 • *Dorex* heavy-duty activated-carbon air-recovery cell, Type T-42 C, has a thicker carbon bed than the T-28 cell and slightly greater resistance to air flow for longer contact with the filter media. Rated at 700 cfm, cell is recommended for odor removal applications other than those in typical comfort conditioning systems, such as recovery of recirculated air in industrial plants and purification of contaminated exhaust and intake air. Bulletin 117-C.

W B Connor Engrg Corp, Shelter Rock Lane, Danbury, Conn.

(*Continued on page* 158)

"Tycol Aturbrio Oils have high oxidation resistance... cut turbine shut-downs"

Tycol Aturbrio Oils are unexcelled for long turbine life. They provide resistance to oxidation and protect against corrosion.

Further, Aturbrio Oils have excellent demulsibility properties. Turbine Operators using Aturbrio report minimum wear . . . utmost turbine efficiency . . . greatly decreased maintenance costs.

For complete information, call or write the nearest Tide Water Associated Office.

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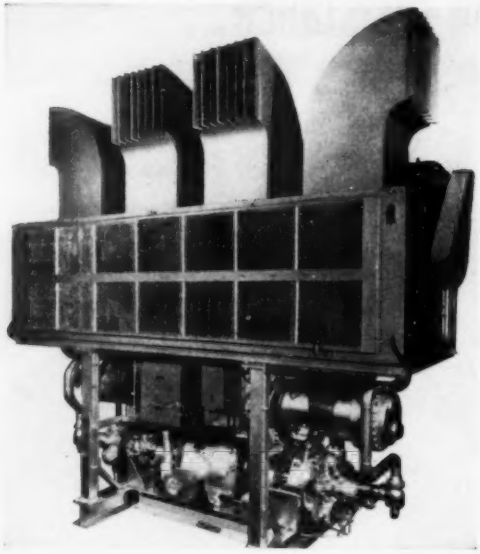
More EQUIPMENT NEWS

Begins on page 154



100-Ton Packaged Air Conditioner

P1044 • New 100-ton packaged air conditioner has three chief advantages: (1) Reduction of field labor. Its refrigeration piping is factory fabricated and tested. (2) Compactness. It produces one ton of refrigeration for each 0.76 sq ft of floor space and weighs only 140 lb per ton of refrigeration. (3) Flexibility. It can be used in multiple or moved if need be.

Unit consists of 3 main parts: condensing section, air handling section and air discharge section. Condensing section contains two radial compressors (7 and 5 cylinders) directly connected to a 100-hp motor, water-cooled condenser that condenses the F-22 refrigerant discharged under pressure from the compressors, and Freon piping and electrical controls. Electrical components and all controls including the compressor starter, compressor motor overload protection, fan switch, high and low pressure cutouts, and thermostats are mounted together on the side of the unit for easy accessibility.

Air handling section contains 4 fans that circulate 35,000 cfm, 28 filters (each 20x20 in., washable, high-velocity type), and four 4-row evaporator coils with face area totaling 73.6 sq ft.

Unit is also available with one- or two-row heating coils with a capacity up to 1,450,000 Btu per hr for winter air conditioning. Dynamically balanced, unit causes no noticeable vibration, needs no foundation and can be placed on floor or roof.

Airtemp Construction Corp, Dayton, Ohio

Flaw Detecting Ink

P1016 • Non-destructive flaw and crack detection inks require no expensive equipment, are simple and effective to use. *Glo-Mor* fluorescent ink, for use on non-ferrous alloys and plastics, deposits in cracks and flaws a material that fluoresces a brilliant green when exposed to ultra-violet light. *Supramor* electromagnetic ink, for use on ferrous metals, gives pattern of flaws when piece is magnetized. Fig., left, shows metal plate, left, before and, right, after ink has been poured on and piece magnetised. Both inks replace costly, tedious methods.

Manchester Oil Refinery Ltd, Twining Rd, Trafford Park, Manchester 17, England

For more data on these items, use post cards, p. 163. Identify request with P and number

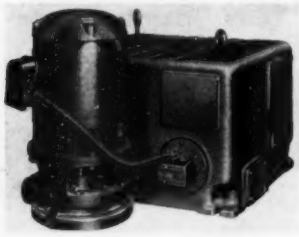
Combustion Safety Control

P1045 • Designed for centralizing combustion safeguard equipment for 2 to 16 burners, *Protect-O-Glo* system incorporates flame rectification combustion safeguard principle. The system features individual flame detecting relays for each burner housed in a single cabinet.

Relays are used in conjunction with a photocell flame detector in the case of oil-fired burners, or with a flame electrode detector on gas or gas-piloted oil fired installations. Flame detector and relay circuit acts to shut down the fuel supply in the event of flame failure at the burner.

There are three operating options available. A sequence light-off, in which the second pilot valve doesn't open until the first pilot flame has been proved; a unison light-off, in which ignition of all burners takes place simultaneously and an independent light-off, in which each burner is individually ignited.

Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Roberts Aves, Philadelphia 44, Pa.



Condensation Pumps

P1030 • Types CS and CD condensation pumps employ vertical drive, close coupled pump for alignment and accessibility. They operate at wide range of pressures and at high temperatures encountered in condensate service. Bronze or other non-corrosive metals in all submerged parts and cast iron receiver give long life. Float switch mechanism can be removed as unit and is easily adjustable to requirements.

Hoffman Specialty Co, 1001 York St, Indianapolis 7, Ind.

Plastic Tape

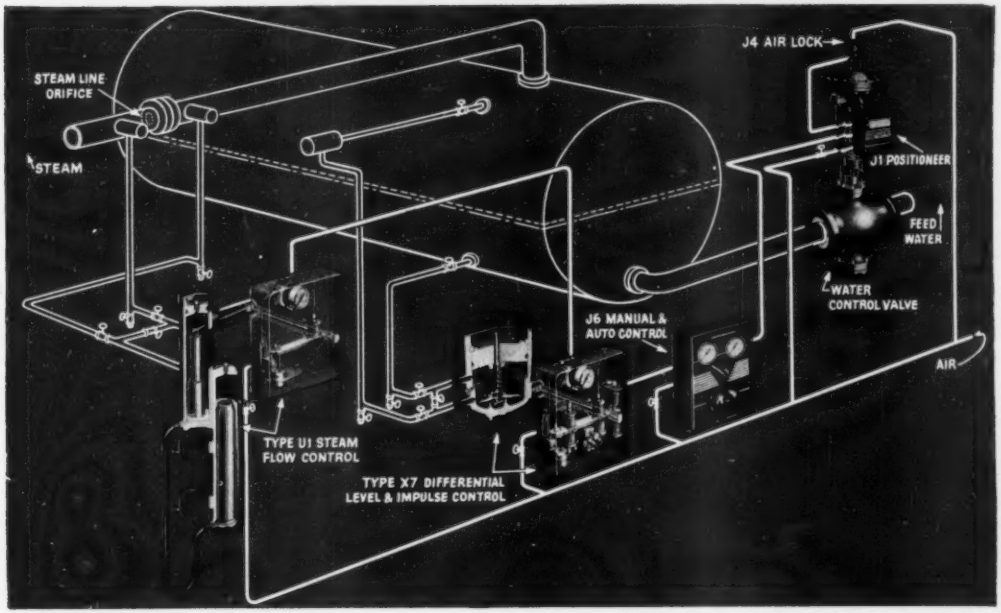
P1006 • Plastic electrical tape provides both insulation and protection against weather and mechanical abuse. Vinyl plastic body has dielectric strength of over 8000 v. It is highly resistant to acids, alkalies, corrosive salts, water, oils, greases and alcohols.

Minimum thickness (.007-in.) of this tape plus its two-way stretch lets it fit snugly to irregular shapes and surfaces. A few layers provide good insulation without bulk. Bulletin P-1.

Ideal Industries Inc, 1025 Park Ave, Sycamore, Ill.

(*Continued on page 160*)

Swartwout Impulse Regulation assures correct feed water supply under any load condition



SWARTWOUT two-element controls—by utilizing the very forces that cause false drum level—produce a corrective impulse that assures correct level even under rapid load swings. Since "shrink" and "swell" are functions of *rate of change*, as well as magnitude of load, only Impulse Regulation gives satisfactory operation under *any rate of change in load of any magnitude.*

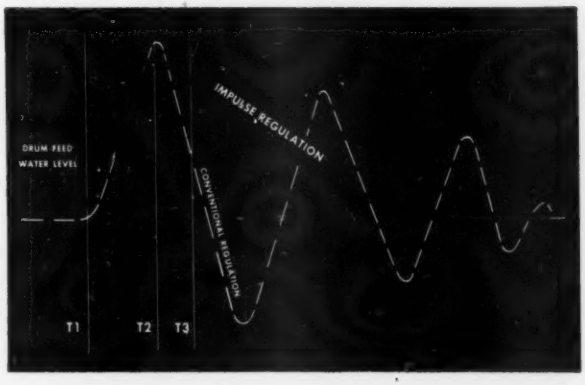
Type U1 flow transmitter takes square root of steam line orifice differential and feeds airloading pressure, which is directly proportional to steam flow at all flows, to X7 differential level and impulse control. X7 unit positions flow valve by sending airloading pressure which is result of combining *rate of change* of steam flow function with water level.

Graph *(right)* shows how proper combination of these forces, plus reset and setback features, assures that valve will give desired operation under *any* load condition. System can be adjusted to maintain drum level constant at all loads, carry it high at high loads, low at low loads, or vice versa. In addition to this FW6 two-element system, Swartwout also makes an FW7 three-element impulse regulating system. Other types include FW5 single-element system and SC (FW1) thermo-hydraulic system.

A-5753

Swartwout

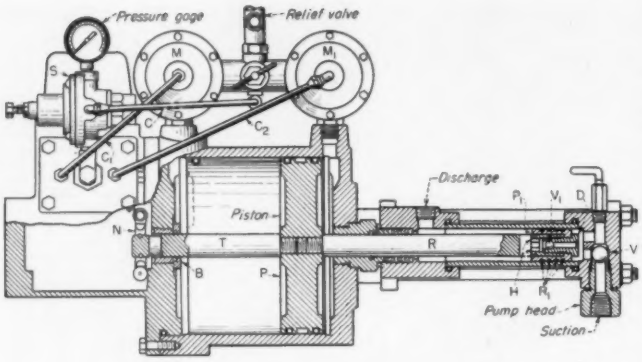
POWER PLANT EQUIPMENT



SEND FOR BULLETINS S-27, S-20-E • THE SWARTWOUT COMPANY, 18511 EUCLID AVENUE, CLEVELAND 12, OHIO

More EQUIPMENT NEWS

Begins on page 154



Gas- or Air-Driven Pressure Pump

P1036 • High-pressure chemical pump is compressed-air or gas driven and powered by a piston P, 8 in. in diameter. A stainless-steel rod R threaded into the piston passes through a packing and connects to the stainless-steel pumping piston P_1 with four cast-steel rings R_1. This piston is held to piston rod R, by the ball discharge-valve assembly D. Suction-valve V is in the pump head.

A tail rod T extends from the rear of piston P, goes through a bushing B with an O-ring packing and connects to a flipper valve or piston reversing mechanism N. Compressed air or gas comes in through a pressure regulator S and through connection C to two master valves M and M_1, one at each end of the power-piston cylinder. Master valves connect to the reversing valves by connections C_1 and C_2. By the action of the reversing and master valves, pressure gas is applied to one side and then to the other of piston P to drive pumping piston P_1.

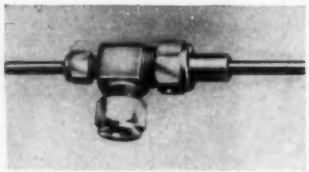
Even though the pump is simplex single acting in design it is double acting in operation and discharges on both suction and discharge strokes. Piston P_1 on the end of rod R has ports H. When the piston moves to the right liquid flows in through these ports into the space around rod R and out the discharge. The cylinder, piston and rod are so sized that only half the liquid flowing through discharge valve V_1 goes out the discharge; the rest remains in the cylinder around rod R. When piston P_1 moves to the left the liquid remaining in the cylinder around rod R is forced out the discharge, while on the right of the piston the cylinder fills with liquid flowing in through suction valve V_1, ready for the next stroke to the right. This double action gives the pump practically a constant discharge. Recommended delivery and pressure of the pump is 2.5 gpm at 5000 psi but it can develop much higher pressure when operated on 200 psi air or gas. Unit has many practical applications.

Texsteam Corp, 320 Hughes St, Houston 11, Tex.

Fin-Cooled Fuse

P1047 • Heat dissipating fins have been added on several sizes of renewable knife-blade type fuses. Six brass fins are used, three spaced equally along each of the two fibre bar supports between fibre bar and copper knife blades. Because of the greatly increased heat transfer surface, the fuse interiors remain cooler so that fuses are even more dependable.

Monarch Fuse Company, Ltd, Jamestown, N. Y.



Heat Exchanger Tee

P1034 • *Swagelok* heat exchanger tee, in brass, aluminum, steel, stainless steel and monel, is designed for steam jacketing or temperature control of process lines. Small end of this fitting is bored through fitting to allow tube complete passage through jacketed end. Available up to 1 in. OD for jacketing tube.

Crawford Fitting Co, 884 E 140th St, Cleveland 10, Ohio

For more data on these items, use post cards, p. 163. Identify request with P and number

CHECK THESE TOO! . . .

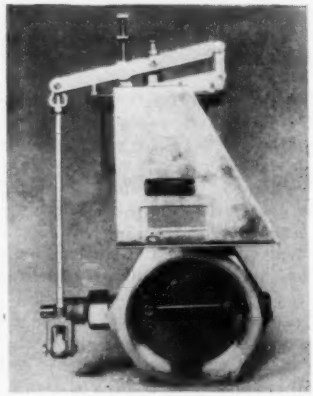
Non-Conducting Pail	p 168
Welding Analyzer	p 170
Tube Cleaner	p 172
Mechanical Coil Flusher	p 174
Valve Shield	p 176
Oil-Air Lubricator	p 178
Liquid Level Control	p 180
Gland-Type Needle Valve	p 184

Refrigeration Oil Additive

P1046 • Penetrating film of *Addit 88* prevents formation of carbon and sludge deposits on bearing surfaces. It will increase film strength of oil. Additive removes deposits of carbon and sludge already formed on bearing surfaces.

Once added to a refrigeration system it remains there for the life of unit. It is effective from – 60 to + 600 F. Additive is neutral with all refrigerants and is suitable for lubrication of refrigerant controls such as expansion valves, two-temperature valves.

Sealed Unit Parts Co, Inc, 261 E 161 St, New York, N. Y.



Pneumatic Butterfly Valve

P1023 • Pneumatically operated butterfly valve for control of air, water or steam flow works on a controlled air pressure range of 0 to 15 psi. The valve motor, described as a *Grad-U-Motor* power unit, has adjustable mechanical stop to limit wing rotation for special applications.

Valve sizes range from 1½ to 6 in., with screwed connections. Body, wing and trim material is bronze. Maximum operating temperature is 250 F, maximum pressure, 20 psi. Optional accessory is *Gradutrol* relay for positive valve positioning on throttling control applications.

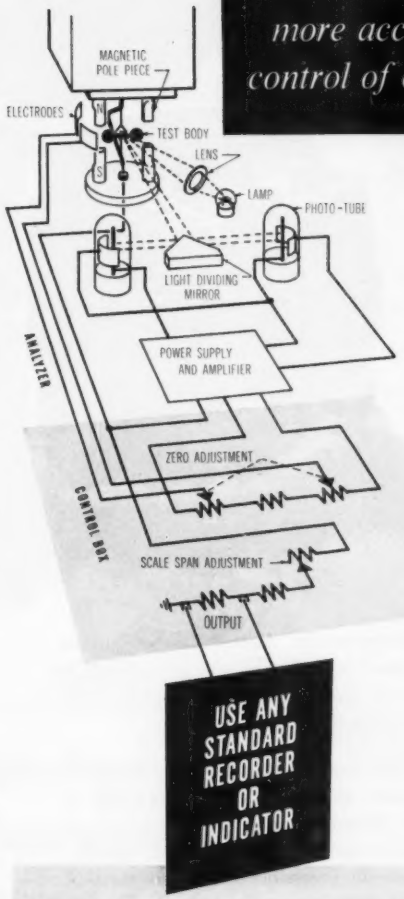
Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Windrim Aves, Philadelphia 44, Pa.

(*Continued on page* 168)

Now—simpler, more accurate control of oxygen

...in combustion processes...with the

Arnold O. Beckman Oxygen Analyzer



The only oxygen analyzer **that employs a direct, physical, fool-proof method for measuring oxygen content in gases, thereby eliminating difficulties encountered in conventional secondary methods of measurement!**

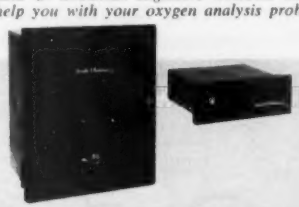
The tremendous advantages of the Arnold O. Beckman Oxygen Analyzer stem from the principle that oxygen is extremely paramagnetic (drawn into a magnetic field), whereas other common gases with few exceptions are diamagnetic (repelled out of a magnetic field). This property of oxygen is so pronounced that oxygen concentrations of only a few parts per million can be detected by the Arnold O. Beckman Oxygen Analyzer simply by measuring the magnetic susceptibility of the gas. This measurement is purely physical, not a chemical analysis, and is accomplished without recourse to filaments, catalysts, chemicals, fuels, etc.

The principle: When a test body within the instrument is surrounded by gas, the body is either drawn closer to the region of maximum magnetic flux density, or it is repelled, in proportion to the oxygen content of the gas. As indicated at left, the result is recorded directly on any conventional recorder or indicator.

The sensitivity and accuracy of the Arnold O. Beckman Oxygen Analyzer surpass that of any other method of oxygen determination. Its simplicity eliminates practically all maintenance. No chemicals or replacements are required. There are no platinum filaments, catalysts, cams or mechanical parts to adversely affect its accuracy. It is completely automatic in its operation. Variety of ranges is greater than obtained by any other commercial analyzer, and multi-range instruments are available. Sampling is simpler.

The Model F-3 can be used with any standard industrial potentiometer recorder or controller. A number of different analyses can be recorded on a multi-record instrument. For pneumatic output for recordings on mechanical instruments, an electro-pneumatic transducer is available.

Write for Bulletin 108 which describes the Model F-3 in detail. Arnold O. Beckman engineers welcome the opportunity to help you with your oxygen analysis problems.



Features of the Beckman Model F-3

SELECTIVITY Highly sensitive to oxygen. Effects of gases other than oxygen are negligible.

MANY RANGES Combustion ranges include 0-5%, 0-10%, 0-15%, and are provided with a second range of 0-25%. Other ranges up to 0-100% O_2 are available. Calibration of the Model F-3 is strictly linear and scale is accurate over the entire range.

HIGH ACCURACY ±1% of full scale for spans of 5% and greater. Accuracies within .05% O_2 on 0-5% range are available.

AIR CHECK Simple positive check of proper operation by recording the air point on the second range.

SIMPLE SAMPLING Independent of flow rate. Nothing is added to the sample. The sample may be dry or saturated. Corrosive gases will not poison the instrument. Only a small sample (3-15 cu. in./min.) is required.

LOW MAINTENANCE Completely insulated against extreme shock and vibration. No chemicals, no catalysts to replenish. No wicks, filaments, orifices, valves, etc., to clean and replace.

STANDARD RECORDERS Any standard industrial potentiometer recorder or pneumatic receiver can be used.

Arnold O. Beckman INC.

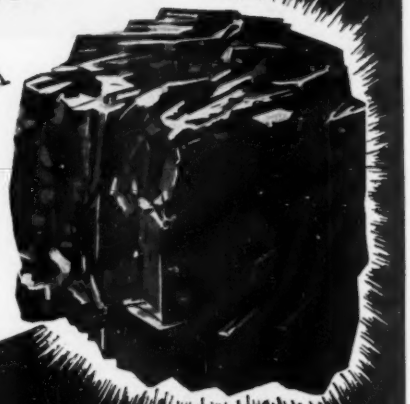
Manufacturers of Industrial and Scientific Instruments

1020 MISSION STREET

SOUTH PASADENA, CALIFORNIA

MEMO TO THE UTILITY INDUSTRY:

Base your expansion on a fuel that's dependable



• In 1951, the great machine that is America required about 370 billion kilowatt-hours of electrical energy. Estimates point to a six-fold increase in this electric power load by 1975.

Bituminous is playing a role of ever increasing importance as a source of this energy. In 1951, the electric utilities consumed approximately 102,000,000 tons, the highest on record. Alert utility executives recognize this and are planning new facilities to use the fuel that will be available in unlimited supply for years to come.

In Baltimore & Ohio territory is a large proportion of America's operating mines as well as billions of tons of undeveloped reserves. Consider these excellent quality, economically accessible coals when planning for new utility power for both the present and the future. For further advice, *ask our man!*

BITUMINOUS COALS FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD

Constantly *doing things*—better!

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City, State.....

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_____

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Please print
Title .....
Company .....
Street Address .....
City, State .....

This month's FREE Literature

AIR CONDITIONING, HEATING REFRIGERATION AND VENTILATION

B1 **UNIT HEATERS** — Propeller fan units, horizontal and vertical types. 16-page catalog 1209 gives capacities, descriptions, applications, specifications. Airtherm Mfg Co, 780 S Spring Ave, St. Louis 10, Mo.

B2 **CABINET AIR CONDITIONERS** — Central station units. 4-page bulletin 114 gives functions, purposes of 4 common types, with charts, tables, check list of functional elements. National Assn of Fan Manufacturers Inc, 2159 Guardian Bldg, Detroit 16, Mich.

B3 **DEHUMIDIFIERS** — 32-page bulletin 222 illustrates applications of *Lectrodryers* in industry. Pittsburgh Lectrodryer Corp, P.O. Box 1766, Pittsburgh 30, Pa.

B4 **AIR RECOVERY CELLS**—Activated carbon units for purification and odor removal. 12-page bulletin 117-C gives dimensions, specifications, selection. W B Connor Engineering Corp, Shelter Rock Lane, Danbury, Conn.

B5 **REFRIGERANT PURGER**—Vents air and other non-condensable gases from refrigerating systems. 4-page bulletin 221 describes operation, uses. Illustrated. Armstrong Machine Works, Three Rivers, Mich.

B6 **ICE-MAKING SYSTEMS** — Equipment for standard ice factories. 4-page bulletin 50-F has photos, descriptions. Frick Co, Waynesboro, Pa.

B7 **COOLING TOWERS** — Mechanical draft type, capacities up to 100 tons of refrigeration. 8-page bulletin 47-A gives dimensions, selection data, photos, performance. Binks Mfg Co, Water Cooling Div, 3122 Carroll Ave, Chicago 12, Ill.

B8 **RADIANT PANELS**—Far-infrared radiation for paint baking, curing, drying, degreasing, etc. 6-page bulletin CS-605 gives dimensions, ratings, intensity controls. E L Wiegand Co, 7731 Thomas Blvd, Pittsburgh 8, Pa.

BOILERS AND AUXILIARIES

B9 **BOILERS**—Two-drum types, 3-VC and 4-VC designs, for oil, gas and stoker firing. 16-page bulletin gives features, dimensions, diagrams. Erie City Iron Works, Erie, Pa.

B10 **PACKAGED STEAM GENERATORS** — Water-tube type, capacities 7500 to 37,500 lbs of steam per hr, oil, gas, or combination firing. 6-page bulletin B-3275 gives dimensions, diagrams, operation. Titusville Iron Works Co, Div of Struthers Wells Corp, Titusville, Pa.

B11 **STOKERS** — Binfeed type with optional side dump ash plates. 8-page bulletin gives advantages, installation diagrams. Canton Stoker Corp, Andrew Place S W, Canton, Ohio.

B12 **ASH AND DUST HANDLING**—Pneumatic systems. Ash hoppers, grids and clinker grinders, transport pipe, collectors, storage silos, unloading equipment, etc. 8-page bulletin 652 gives general component features, schematic diagram. Allen-Sherman-Hoff Co 259 E Lancaster Ave, Wynnewood, Pa.

B13 **MATERIALS-LEVEL INDICATOR** — *Bin-Vue* unit for use with any dry bulk material that flows. 4-page bulletin gives photos, dimensions, prices. Convair Corp, 1501 Potomac Ave, Pittsburgh 16, Pa.

B14 **PIT COVERS**—For steel mill soaking pits. 4-page bulletin 353 gives component parts, shows construction. Geo P Reintjes Co, 2517-19 Jefferson St., Kansas City 6, Mo.

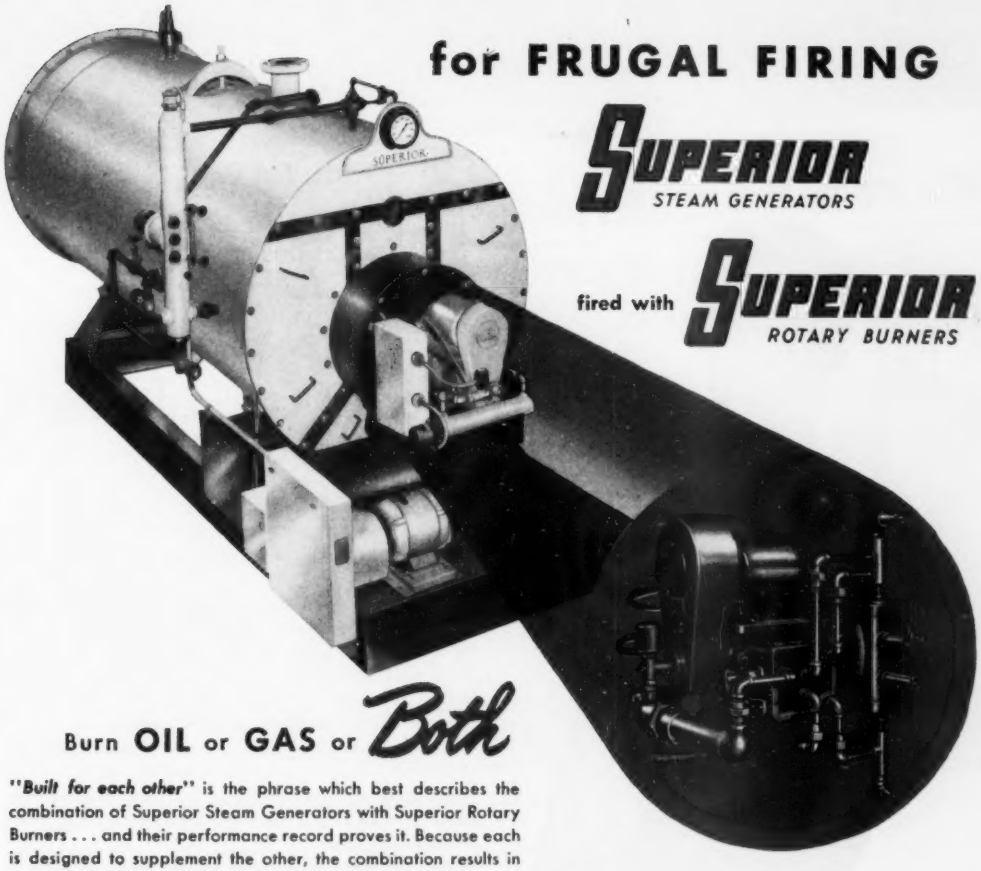
B15 **GAS SCRUBBERS**—Horizontal and vertical flow units. 2-page bulletin supplement 4RA gives applications, types, standard parts, advantages. Schutte and Koerting Co, Cornwells Heights, Bucks Co, Pa.

(Continued on page 220)

for FRUGAL FIRING

SUPERIOR
STEAM GENERATORS

fired with **SUPERIOR**
ROTARY BURNERS



Burn OIL or GAS or *Both*

"Built for each other" is the phrase which best describes the combination of Superior Steam Generators with Superior Rotary Burners . . . and their performance record proves it. Because each is designed to supplement the other, the combination results in combustion efficiencies that spell maximum fuel economy.

Where combination gas/oil burners are employed, a specific advantage of Superior Burners lies in the ease and simplicity of changing from either fuel to the other. The changeover takes but a minute or so without disconnecting any piping, and without interruption of steam supply.

Superior Rotary Burners are fully automatic, burning the heaviest catalytic fuel oils. Gas burners burn any type of natural, manufactured, or bottled gas. Owners of Superior combination gas/oil burners can profit from the slightest fluctuation in the price of either fuel . . . switching from one to the other as economy dictates.

Superior Steam Generators are manufactured in 18 sizes, ranging from 20 to 600 b.h.p. for pressures to 250 p.s.i., or for hot water.

For complete details write for Catalog 401.

Sound fundamentals contribute to the high operating efficiencies of Superior Rotary Burners,

- Time-tested horizontal-rotary design.
- V-Belt Drive for the high cup speed essential to efficient atomization.
- Four-Hole Hinge circulates oil through oil heater so that hot oil is on the pressure side of the pump, allowing you to burn oil at higher temperatures.
- Adjustable Air Nozzle provides accurate control of flame contour.
- Dual Pumps and Reservoir combined with Constant Oil Rate Control provide controlled firing regardless of viscosity variation.
- Fully automatic with dual ignition, and hi-low or fully modulating control.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N.Y.

SUPERIOR
STEAM GENERATORS

What! Another Cracked Head?

YES, YOU OLD BUZZARD, another cracked head! That's eight cracked cylinder heads and five split cylinder liners since I advised putting in those engines four years ago.

Your ancient steam plant had worked its guts out, so I showed you how diesels would give you cheaper power and put you back in the black. But I specified heavy-duty diesels, with a closed cooling-water system and temperature controls. Also lube and fuel oil purifiers, and all the other trimmings needed for efficient operation.

Instead, you shopped around for the cheapest setup you could find. To save a few dollars, you hooked up to that mucky creek without closed coolers. Then you chiseled a few more pennies by leaving out the purifiers and temperature controllers.

Sure, the board of directors ate that up. You were a hero. But Bob, Pete, Jim and myself have worked many nights, just to have those engines running next morning. Water from that polluted creek, at all kinds of crazy temperatures, knocked out those heads and liners. And trying to adjust the temperature by hand has run us ragged.

Old Pete is the best darn diesel man this side of the Rockies. But at his age he should be home nights, reading bedtime stories to his grandchildren.

Now, you old skinflint, I've worried about your last breakdown. If you want the directors to give you another gold watch while we sweat blood over your pile of junk, you have another guess coming. You run your misfit scrap pile yourself. I'm through!

All too many penny wise bosses deserve skin scorchings like the above. Here's hoping you never receive one—or have to hand one out.

George Edwards

DOWELL SERVICE

CHEMISTRY APPLIED TO MAINTENANCE CLEANING PROBLEMS

A Power Company Asked:

How can we do a better job of removing mill scale from our new boiler?

Dowell Service removed mill scale AFTER ERECTION... leaving the internal surfaces clean for best operation!

A large power company installed a new 1,370,000 lb. per hour boiler. Specifications called for Dowell Service to remove the mill scale from the boiler *after erection*. This company found the Dowell way of removing mill scale to be good insurance for satisfactory boiler operation.

Dowell engineers filled the new boiler with specially selected liquid solvents designed to dissolve out mill scale. Unless it is removed, mill scale may retard heat transfer, slough off particles which abrade the system during operation, and act as a base for further corrosion. Dowell furnished trained personnel and special equipment to do the entire job in a few hours. Removal of mill scale *after* equipment erection can eliminate much of the extra care required in the handling of previously sand blasted or pickled tubes. It may also substitute for the grease-removing alkaline pre-boil.

Maintenance engineers in industrial plants throughout the country have found Dowell Service can provide *fast, effective and economical* cleaning of boilers, condensers, heat exchangers, water lines and other operating equipment. Experienced engineers will consult with you on your particular problems. Call Dowell today.

Other recent Dowell jobs:

Three Dowtherm boilers in a southwestern chemical plant were cleaned by Dowell Service. Carbonaceous type deposits were removed.

•

Two bubble cap columns in an oil refinery were clogged with a complex deposit of antimony and aluminum salts. After Dowell Service, the towers were found to be spotless.

•

Rotor and stator of a 625 K.W. turbo-generator were fouled with a carbonate deposit carried over from the boiler. Dowell Service cleaned blading completely in 3 hours. Result: Machine is running smoothly again.

DOWELL INCORPORATED • TULSA 1, OKLAHOMA

New York 20	Pittsburgh 19	Ft. Worth 2	Mt. Pleasant, Mich.
Boston 16	Detroit 2	Shreveport 69	Hamilton, Ohio
Philadelphia 2	Chicago 4	Atlanta	Charleston, W. Va.
Baltimore	St. Louis 8	Indianapolis	Salem, Illinois
Wilmington 99	Kansas City 8	Louisville	Beaumont, Texas
Richmond 19	Wichita 2	Upper Montclair, N. J.	Borger, Texas
Jacksonville 2	Oklahoma City 2	Anniston, Alabama	Midland, Texas
Buffalo 2	Houston 2	Hattiesburg, Miss.	Wichita Falls, Texas
Cleveland 13	New Orleans 12	Lafayette, La.	Hobbs, N. Mex.

CALL

★ *Maintenance cleaning service for industrial heat exchange equipment.*

★ *Chemical services for oil, gas and water wells.*

DOWELL

A Service Subsidiary of

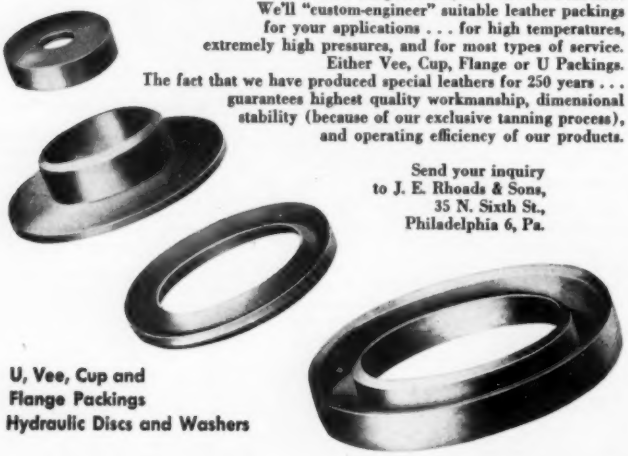
THE DOW CHEMICAL COMPANY

"packing" trouble?

We'll "custom-engineer" Leather Packings to suit your requirements

Naturally, Tannate mechanical leather packings require less maintenance, do not require lubrication, are not affected by sub-zero temperatures, and do not cold-flow. We'll "custom-engineer" suitable leather packings for your applications . . . for high temperatures, extremely high pressures, and for most types of service. Either Vee, Cup, Flange or U Packings. The fact that we have produced special leathers for 250 years . . . guarantees highest quality workmanship, dimensional stability (because of our exclusive tanning process), and operating efficiency of our products.

Send your inquiry to J. E. Rhoads & Sons, 35 N. Sixth St., Philadelphia 6, Pa.



U, Vee, Cup and Flange Packings Hydraulic Discs and Washers

250 J. E. **RHOADS** & SONS
PHILADELPHIA • NEW YORK
CHICAGO • ATLANTA
YEARS PRODUCING FINE LEATHERS

More EQUIPMENT NEWS

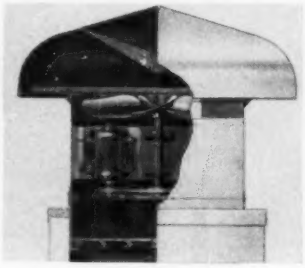
Begins on page 154

Aluminum Tube Fittings

P1048 • This standard-stock line of aluminum tube fittings for strictly industrial rather than aircraft use includes male and female connectors, elbows, tees, union and tube end reducer for ¼-; 5/16-; ⅜- and ½-in. outside tubing.

Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio

For more data on these items, use post cards p. 163. Identify request with P and number



Ventilator

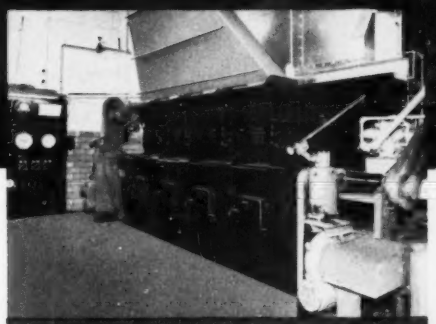
P1019 • Combining high capacity, weather proofing, quietness and high efficiency with simplicity of installation, new power driven fan ventilator may be used either as an exhaust ventilator or a fresh air supply unit. Sizes range from 12 to 60 in., with either direct motor drive or V-belt pulley drive. Bulletin SPV-16.

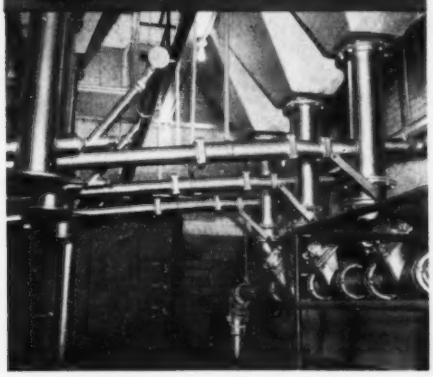
Burt Mfg Co, Dept PO, Akron 11, Ohio

Non-Conducting Pail

P1049 • Protecting railroad, power plant and industrial workers from high voltage shock is latest application of new *Ace-Hide* pail. Made of high-strength rubber-plastic

Nash Motors SELECTS
DETROIT ROTOGRATE STOKERS





Nash Motors, Division of Nash-Kelvinator Corporation purchased two 100,000 pound per hour RotoGrate Stokers for their Kenosha plant. Boilers are Babcock and Wilcox 4 drum Stirling with superheaters and economizers. A similar stoker unit was purchased for the Nash Milwaukee plant.

Detroit RotoGrate is an improved spreader stoker. Grates move slowly forward to discharge the ash at the front. Coal feed, grate speed and air supply are synchronized at all capacities. A wide range of Bituminous Coal or Lignite may be burned. Controlled high turbulence and rugged, dependable cinder reinjection system contribute to fuel economy. Grates are of unique design which permits more burning capacity per square foot.

Write for RotoGrate Bulletin.

DETROIT STOKER COMPANY

GENERAL MOTORS BLDG., DETROIT 2, MICH.

District Offices in Principal Cities · Works in Monroe, Mich.

COMPACT

within arms' reach

MORE STEAM
in LESS SPACE... at LESS COST!

The Clayton Forced Recirculation Steam Generator produces more steam per pound of weight and per cubic foot of space occupied than any boiler known... and at less cost. Fast steaming, automatic and safe, the Clayton Generator sets a new standard of efficiency for the production of processing steam. It is the only steam generator with a cost curve that parallels the load demand curve through all stages of operation. Each unit... 15 to 100 h. p.... is complete, ready to connect and operate upon delivery. No burners, pumps, instruments or accessories to buy.

THIS COUPON BRINGS PROOF TO YOUR DESK

An animated, colored flow chart shows you how and why the Clayton Forced Recirculation principle can cut your steam costs.

P-10

CLAYTON MANUFACTURING COMPANY
Box 550, EL MONTE, CALIFORNIA

Send name of nearest distributor and arrange desk demonstration of Clayton Forced Recirculation principle. Send catalog.

NAME_____
FIRM_____
ADDRESS_____ STATE_____
CITY_____

Clayton
MANUFACTURING COMPANY
Box 550, EL MONTE, CALIFORNIA

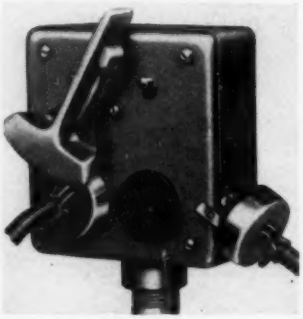
More EQUIPMENT NEWS

Begins on page 154

blend, new pail is not only non-conducting, but is far more durable than fiber pails previously used for shock protection. Pail literally bounces without denting or chipping. It is also resistant to concetnrated solutions of most inorganic acids and alkalies as well as to most solvents and features a drip proof spout that keeps outside of pail clean.

American Hard Rubber Co, 93 Worth St, New York 13, N.Y.

For more data on these items, use post cards p. 163. Identify request with P and number



Inter-Lock Receptacle For Hazardous Locations

P1050 • Receptacle has a sealed mercury switch that de-energizes each socket before plug may be inserted or removed. This eliminates danger of sparking.

Mercury switch works on a cam lever that locks cord set-caps in position after they are inserted. In locked position mercury switch completes circuit. Simple flip upward of cam lever tilts switch, breaks circuit and allows cord caps to be pulled out safely.

Ratings of either 115-v, 20-amp or 250-v, 10-amp, are available. Interlock receptacle may be furnished for single, duplex or dual 3-wire; single or dual 4-wire service.

Tigerman Engineering Co, 4332 N Western Ave, Chicago, Ill.

Welding Analyzer

P1011 • New direct-writing welding analyzer records single- and three-phase resistance welding machine variables. Welding current and electrode force are measured and recorded simultaneously, showing the squeeze, weld, hold and off time intervals. Analyzer also records the small 180 cycle per sec component present when

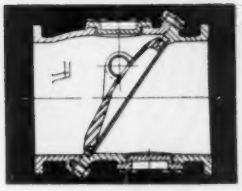
INSTALL

CHAPMAN

Tilting-Disc Check Valves

Take another look at the diagram below. That tilting disc actually *balances as it closes* . . . so that it cushions itself into a drop-tight seat . . . without any slamming under usual piping arrangements.

This means far lower head loss than with other types of check valves. It means, too, far lower rate of wear of moving parts . . . for the disc is the *only* moving part. In fact, it means more savings and less trouble than you ever knew you could get with *any* check valve. Write for Catalog No. 30, giving complete test results at some of the country's leading engineering laboratories.



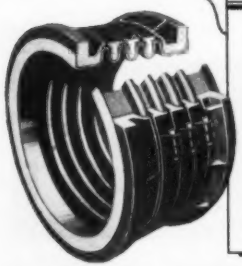
Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MFG. CO.
INDIAN ORCHARD, MASSACHUSETTS

DESIGNED for FLEXIBILITY

Badger Expansion Joints set the standards in the field of expansion joints — engineered for long life and designed for flexibility. For protection from damage to equipment by absorbing the expansion and contraction in piping due to temperature changes, specify Badger Expansion Joints.

D-F S-E Directed-Flexing Self-Equalizing: an exclusive feature of Badger Expansion Joints. The flexing of the corrugations is progressively directed over each segment of each of the all-curve corrugations by correspondingly shaped self-equalizing rings. Localized stresses are eliminated insuring a more flexible longer lasting joint.



Buy Badger Joints and you get flexibility, D-F S-E and these features:

- Packless . . . pressure-tight single tube — requires no maintenance
- Compact . . . approximately the size of flanged fitting
- Special forming . . . no structure-weakening stresses
- Controlled heat treating . . . assures long life
- Wide range of traverse — pressure — temperature

Fabricated from deoxidized copper, stainless steel and special alloys to meet various operating conditions.

BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE • MASS.

More EQUIPMENT NEWS

Begins on page 154

ignitron rectifiers are used. Operator can adjust welding machine as measurements are being made due to immediate response of direct writing oscillograph.

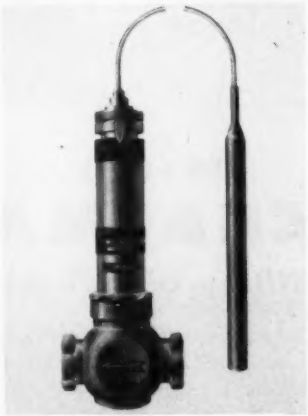
Brush Development Co, Instrument Div, 55 E, 3405 Perkins Ave, Cleveland 14, Ohio

For more data on these items, use post cards p. 163. Identify request with P and number

Tube Cleaner

P1018 • New tube-cleaning water gun and projectile operate from 120 to 200 psi. Gun is adaptable to different tube sizes by changing nozzles, and vacuum breaker prevents water from floating back on operator when valve is closed. Cleaning projectile has high-pressure scrapers that cut deposits loose rather than ride over them. Large holes in blade let water rush through to prevent clogging.

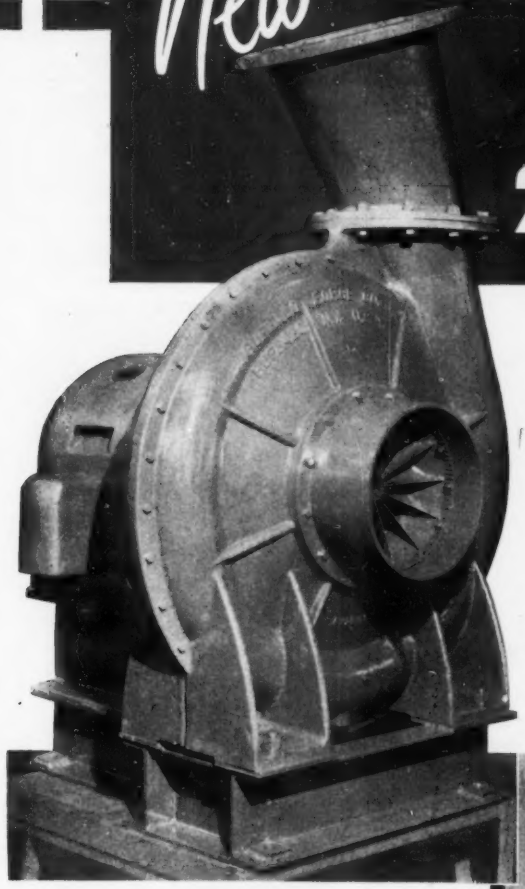
Condenser Cleaners Mfg Co, 1041 McCartney St, Pittsburgh 20, Pa.



Temperature Regulators

P1028 • Designed in either direct or reverse acting types for heating and cooling applications, Series V self-operated temperature regulators can handle steam, liquids, gases and all fluids not corrosive to brass. Operation is based on liquid expansion being proportional to temperature increments, and valve movement is gradual. Available from ¾ to 4 in., regulators will control temperatures between 25 and 275 F,

New KAISER ALUMINUM PLANT Uses 224 "Buffalo" FANS



• FOR DIESEL SCAVENGING

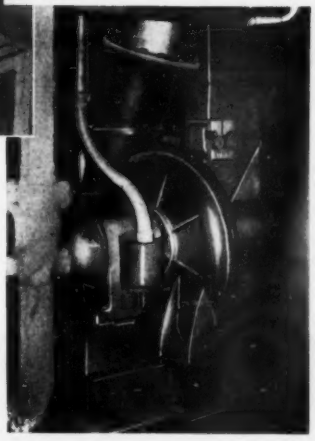
Eighty of these extremely compact high pressure "Buffalo" Blowers supply scavenging air to the radial Diesels in the giant new Kaiser Aluminum plant at Chalmette, Louisiana.

• FOR EXHAUST —

Sixty-four 100-inch "Buffalo" NW Exhausters serve on pot line exhaust at the new plant. Powered by 75 h.p., 1200 rpm motors, they have heavy plate housings and wheels to resist abrasion.

• FOR FRESH AIR SUPPLY —

Eighty 54-inch "Buffalo" Tubeaxial Fans supply fresh air quietly and efficiently. These fans require a minimum of space, and have cast aluminum wheels.



•BUILT FOR HIGH PRESSURES!

Heavy, ribbed cast iron housings and welded steel wheels mean efficient performance at high air velocities and pressures, in "Buffalo" Scavenging Blowers.

Send Your AIR PROBLEM TO "BUFFALO"!

Hundreds of business leaders like Kaiser Aluminum are relying on "Buffalo" Fans and Air Conditioning Units for plant-wide comfort, and the 1001 other jobs air does for industry. What is your air problem? *There's a "Buffalo" Fan to solve it. Let us mail you details.*

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

488 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Make This Date NOW!

. . . for YOUR Benefit

MEMO

Don't Say It — Write It

Miss M—

Make no appointments for me Dec. 1-6. I'll be attending the National Power Show in New York. That Harrison deal can wait, and so can anything else. Seeing the Power Show is always a must.

J.B.

P.S. Expect to take Joe and Bill along.

Anyone concerned with steam, electric, or mechanical power problems can benefit greatly by attending this outstanding Exposition. Concentrated here will be interesting displays and informative demonstrations on . . .

317 **DIFFERENT KINDS OF PRODUCTS**
No where else can you see and compare so many things of vital interest to you and your company . . . in so little time.

344 **LEADING MANUFACTURERS**
will be represented by technical men on hand to show you the latest equipment, materials, and methods for power production, distribution and use, and to help solve your present problems and future requirements. Yes, a wealth of NEW IDEAS awaits you at the

20TH NATIONAL POWER SHOW

National Exposition of
Power & Mechanical Engineering

GRAND CENTRAL PALACE, New York

DEC. 1-6

ASME Auspices in conjunction with Annual Meeting

MANAGEMENT INTERNATIONAL EXPOSITION CO

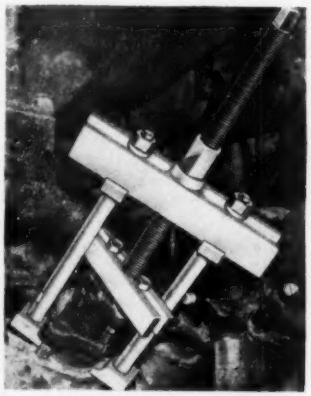
More EQUIPMENT NEWS

Begins on page 154

with a 50 F range of adjustment. Inlet pressure limit is 125 psig, inlet temperature limit is 450 F. Regulators are made with bronze bodies, renewable bronze or stainless-steel seats and have an 8 ft nickel plated copper capillary tube and nickel plated brass bulb standard.

Farris Staeon Corp, 627 Commercial Ave, Palisades Park, N. J.

For more data on these items, use post cards, p. 163. Identify request with P and number



Injection Nozzle Puller

P1051 • New puller for removing fuel injection nozzle from cylinder head on all *International Harvester* diesel engines is fast, efficient, exerts straight, powerful pull. Tool is adjustable and may be used for other pulling jobs as well. Puller No. HC-689.

Owatonna Tool Co, 378 N Cedar St, Owatonna, Minn.

Mechanical Coil Flusher

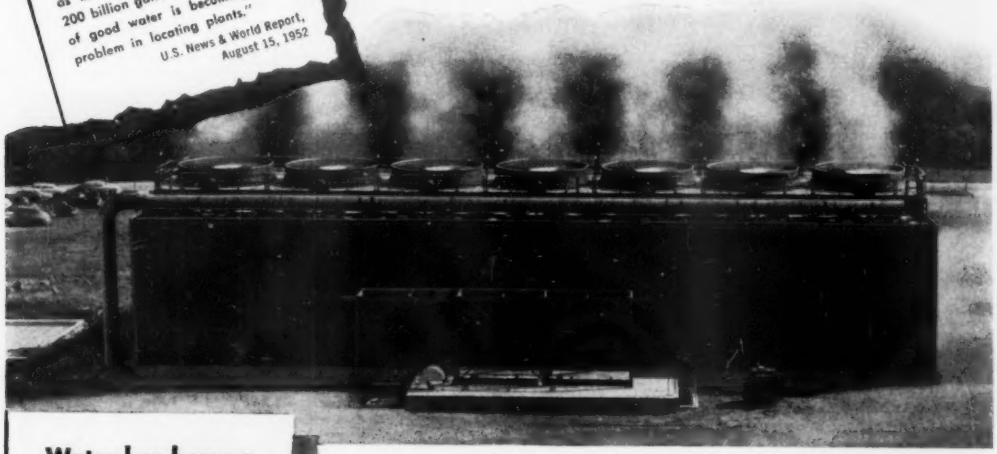
P1026 • Mechanical refrigeration coil flusher, *Dri-Sol* gun forces solvent through lines and coils under pressure up to 500 psi. New solvent is non-toxic, non-flam-

this Marley Cooling Tower will be *twice as valuable tomorrow!*

2½ times as much water in 1975...

"... And there's industrial water—water used by industries for cooling or washing, or as a material. Industry will be needing 2½ times as much in 1975—something like 200 billion gallons a day. Shortage of good water is becoming a key problem in locating plants."

U.S. News & World Report, August 15, 1952



Water has become a problem...

"Even water, once regarded as a 'free commodity' of virtually unlimited supply, has become a problem. . . . The essence of the . . . problem is costs."

Fortune, August, 1952

Industry will spend about $10 billion more...

"The waste of our civilization threatens one of our vital resources: water. . . . It is estimated that . . . U.S. industries will probably have to spend about $10 billion more . . ." (to handle waste water in the next 20 years).

Scientific American, March, 1952.

In 1975, according to reliable estimates, American industry will require 2½ times as much water as it does today. It follows that the ability of your present cooling equipment to conserve water will be of much greater value tomorrow when water is twice as scarce. Provided, of course, that the cooling towers you buy now are still operating in 1975.

If you buy Marley towers today, you are investing in this added value, for only Marley offers the rugged, service-proved structural features that assure such long-term, trouble-free performance. Marley provides today the design refinements that will still be modern in years to come—full height louver walls . . . open distribution . . . MortisLocked filling . . . mechanical equipment engineered exclusively for cooling tower service.

Many Marley towers have been in service for 25 years—and continue to deliver cold water day in, day out. That's why, no matter what your term of amortization, you will find a Marley cooling tower among your major assets long after it has been written off the books.

For a sound investment in the future of your company, buy your next tower from Marley, world's leading producer of water-cooling equipment.

MARLEY

The Marley Company, Inc.

Offices in 50 Cities

Kansas City 5, Missouri

Texture-engineered for long-life efficiency

★ IN PUMPS
★ IN AIR CYLINDERS
★ IN HYDRAULIC CONTROLS

In Darcova Pumcups you get far more than ordinary cup-type packing. Pumcups are engineered in many textures and compositions—the result of years of application research. Thus there is a type *ideally* suited for use with practically any fluid under a wide range of pressure and temperature conditions.

This texture engineering is one of the reasons why Pumcups outlast most other packings at least 3 to 1. Then, add to this cost-saving advantage the fact that Pumcup efficiency remains virtually constant *despite wear.* You'll see why Pumcups are going into more and more reciprocating pumps and air and hydraulic cylinders of every description.

SEND FOR FREE BULLETIN

Bulletin 4401 covers Darcova Pumcups for reciprocating pumps; Bulletin 4502 on Pumcups for air or hydraulic mechanisms. Write for yours today and get *all* the facts!

DARLING VALVE & MANUFACTURING CO.
Williamsport 8, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP

PUMCUPS

More EQUIPMENT NEWS

Begins on page 154

mable at temperatures below 130 F, and readily attracts moisture. It effectively dissolves sludges, wax deposits and other foreign material, and is recommended for Freon and methyl chloride systems.

Gun capacity is 3 pints; it measures 3½x21¼ in., weighs 10 lb fully charged. It is pressurized by a 2-oz. replaceable carbon dioxide cylinder.

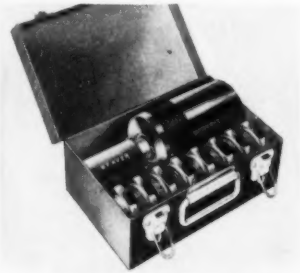
Ansul Chemical Co, Refrigeration Div, Marinette, Wis.

For more data on these items, use post cards p. 163. Identify request with P and number

Valve Shield

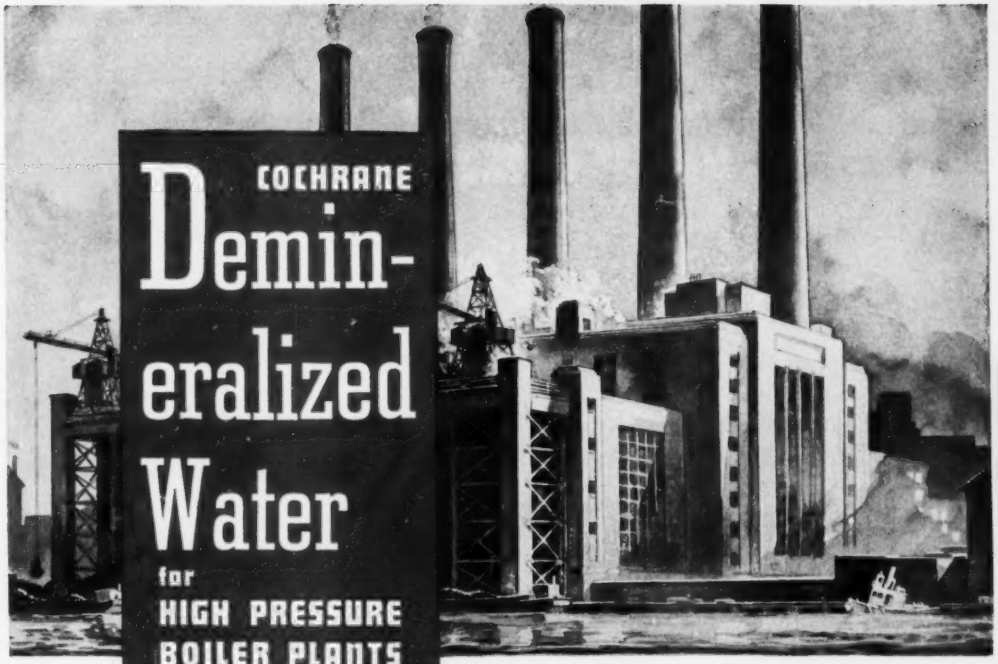
P1033 • Flexible valve shield prevents acid from spraying on operator if valve packing fails. Shield is made of neoprene synthetic rubber, which is resistant to most chemicals and to deterioration by sunlight. Advantages, in addition to long life, are flexibility and ease of installation.

Industrial Products Co, 2820 N Fourth St, Philadelphia 33, Pa.



Universal Nipple Chuck

P1052 • *Beaver 55,* capable of threading ⅛- to 2-in. pipe, has three parts—polished steel body, sliding plunger, and hardened-steel threader shank. Nipples are easily removed by hand—no wrenches required. Adapters allow for all sizes from ⅛ to 1½



COCHRANE Demineralized Water for HIGH PRESSURE BOILER PLANTS

DEMINERALIZED boiler make-up water as an alternative to water supplied by evaporators has become a topic of great interest to boiler plant operators everywhere. Comparisons of costs, both original equipment and operating costs, have shown exceptional savings by demineralizing.

Some advantages that have been shown include:

1. **Demineralizers insure constant adequate makeup supply,** as they always operate at rated capacities. Evaporator output varies with the turbine load, consequently rated output is not maintained at low loads.
2. **Gains in turbine-cycle efficiency** more than offset the cost of chemicals used in demineralizing.
3. **Demineralized water is more uniform** and practically free from corrosive CO_2.
4. **Lower maintenance costs.** Corrosion due to CO_2 produced by evaporators is responsible for maintenance not necessary where demineralized water is used.
5. **Lower labor costs.** Demineralizing plant can be made automatic.

While the problem of corrosion can often be licked by pretreating the water with hydrogen zeolite or by demineralizing ahead of the evaporators, many plants are finding that demineralizing including anion silica removal without evaporators is more satisfactory and in addition more economical.

Cochrane has some comparison figures on the subject and will be glad to send them to interested executives.

COCHRANE CORPORATION • 3106 N. 17th St. • Philadelphia 32, Pa.

In Canada: Canadian General Electric Co., Ltd., Toronto • In Mexico: Babcock & Wilcox de Mexico, S. A., Mexico City • In Europe: Recuperation Thermique & Epuration, Paris

COCHRANE

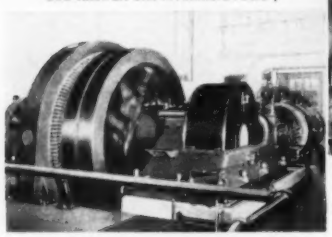
COCHRANE CORPORATION 89 YEARS OF SERVICE 1863 - 1952

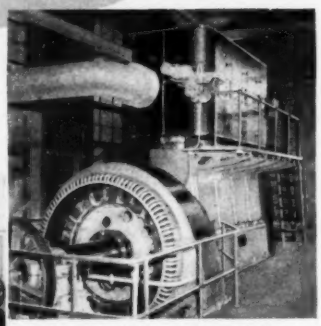
PIONEERS AND LEADERS IN BOILER FEED PROCESS & INDUSTRIAL WATER CONDITIONING

IN THE
WOODWORKING
INDUSTRIES

Electric Power Costs
are *Lowered* with
SKINNER
"Universal Unaflow"
STEAM ENGINES

800-Kilowatt Unit in Furniture Factory





One of six 1250-kw. A-C four-cylinder "Universal Unaflow" engines, in furniture plants of one manufacturer.

The woodworking industries are varied . . . they include manufacturers of furniture, flooring, containers, shooks, plywood, toys, and novelties. But they all need power and light. They all need steam . . . for manufacturing processes . . . for space heating.

Many of them have found an economical solution for all these needs in a single installation . . . a Skinner "Universal Unaflow" Steam Engine power plant. They have, under their own roof and under their own control, a dependable, unfailing source of power for all needs; they have ample low-pressure steam for use in their manufacturing and for space heating . . . and they are saving thousands of dollars every year over the cost of providing these needs by any other means.

Woodworking companies, together with many other manufacturers, food processors, breweries, and institutions, have been depending on Skinner Engines for four decades.

Write for case studies of what has been accomplished in industries similar to yours.

For Over 80 Years, Doing One Thing Well—Building Steam Engines

SKINNER ENGINE COMPANY, ERIE, PA.

More EQUIPMENT NEWS

Begins on page 154

in., with no adapter needed for 2 in. pipe. An inserted pin retains the sliding plunger in working position.

Beaver Pipe Tools, Inc, 310 Dana St, N.E., Warren, Ohio

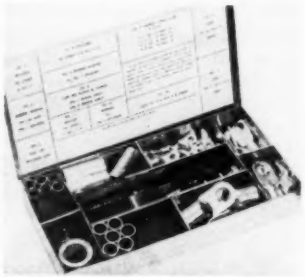
Oil-Air Lubricator

P1002 • *Oil-Mist* lubricators have one-gallon oil reservoirs and built-in automatic warning switches. Operator is signaled by horn and red light or machine shuts off if oil level becomes too low. Warning units with 12-oz. reservoirs are also available.

There are two models with gallon reservoirs. Model 4958 has normally open switch that makes contact when oil level goes below 23 oz. Switch sets off an immediate warning by red light and/or horn. Model 4859 has a closed switch that breaks contact and shuts off machine when oil level goes below 23 oz.

Stewart-Warner Corp, 1826 Diversey Pkwy, Chicago 14, Ill.

For more data on these items, use post cards p. 163. Identify request with P and number



Cable Repair Kit

P1003 • *Fast Fix* kit for on-the-job repair of electric welding or power cables. Kit contains all necessary tools and replacement parts for putting new lugs on No. 14 through No. 6 power cable, and splicing or putting new lugs on No. 6 through No. 4/0 welding or ground cable.

Rubber sleeves and friction tape are provided for insulating and properly finishing off the work. *Tweco* lug set block and

when you READ THIS BOOKLET....

You'll know **WHY** these leading companies selected **HONAN-CRANE** oil purification equipment

FOR THEIR TURBINES, DIESELS, TRANSFORMERS, CIRCUIT BREAKERS, SWITCH GEAR AND OTHER OIL-FILLED EQUIPMENT

ABITIBI POWER & PAPER CO. LTD. Iroquois Fall, Ontario	ETHYL CORP. Baton Rouge, Louisiana	SCRANTON ELECTRIC CO. Scranton, Pennsylvania	MINNKOTA ELECTRIC SERVICE CO. Fargo, North Dakota	MEMPHIS POWER & LIGHT Memphis, Tenn.
THE ANNEVAR MILLS Ravenna, Ohio	FLORIDA POWER CORP. St. Petersburg, Fla.	UNION ELECTRIC STEEL CORP. Carnegie, Pennsylvania	MISSOURI PACIFIC R. R. CO. St. Louis, Missouri	MUNICIPAL LIGHT & POWER PLANT Hutchinson, Minn.
CENTRAL KANSAS ELECTRIC COOP. ASSOC., INC. Great Bend, Kansas	NORTHERN STATES POWER CO. Minneapolis, Minn.	WEIRTON STEEL CO. Weirton, West Virginia	MURRAY CORP. OF AMERICA Detroit, Michigan	CENTRAL MAINE POWER CO. Augusta, Maine
CINCINNATI GAS & ELECTRIC CO. Cincinnati, Ohio	OMAHA PUBLIC POWER DISTRICT Omaha, Nebraska	WESTINGHOUSE ELECTRIC INT'L New York 5, New York	MUNICIPAL ELECTRIC PLANT Glencoe, Minn.	KAISER ALUMINUM AND CHEMICAL CORP. Chalmette, La.
CITY PUBLIC SERVICE BOARD San Antonio, Texas	PENNSYLVANIA POWER COMPANY New Castle, Pennsylvania	GULF POWER COMPANY Pensacola, Florida	NATIONAL LEAD CO. Henderson, Nevada	CONSOLIDATED EDISON New York City
COPPERWELD STEEL CO. Warren, Ohio	PENNSYLVANIA POWER & LIGHT CO. Hazleton, Pennsylvania	INDIANAPOLIS POWER & LIGHT Indianapolis 6, Indiana	WESTINGHOUSE ELECTRIC CORP. Detroit, Michigan	MUNICIPAL POWER PLANT Houma, La.
CORPORACION PERUANO DEL SANTA Lima, Peru	PHELPS DODGE PRODUCTS CORP. Indiana Rod & Wire Div. Fort Wayne, Indiana	INDUSTRIAL RAYON CORP. Painesville, Ohio	CITY OF LOGANSPORT Logansport, Indiana	MUNICIPAL POWER PLANT Colby, Kans.
EASTERN NEBRASKA PUBLIC POWER DIST. Syracuse, Nebraska	POLYMER CORP. Sarnia, Ontario, Canada	INLAND STEEL CO. Indiana Harbor, Ind.	INDUSTRIAL RAYON Cleveland, Ohio	OHIO PUBLIC SERVICE CO. Cleveland, Ohio
CITY OF EDMONTON Edmonton, Alberta, Canada	PORTLAND GENERAL ELECTRIC CO. Portland, Oregon	IOWA PUBLIC SERVICE CO. Waterloo, Iowa	MUNICIPAL WATER & ELECT. PLANT Carthage, Mo.	MUNICIPAL POWER PLANT Sioux Falls, S. D.
ELECTRO METALLURGICAL CO. Alloy, West Virginia	QUEBEC HYDRO-ELECTRIC COMMISSION Montreal, Canada	IOWA-ILL. GAS & ELECTRIC CO. Rock Island, Illinois	KANSAS GAS & ELECTRIC Wichita, Kans.	CITIES SERVICE REFINING CORP. Lake Charles, La.

. . . and many others!

CLIP THIS COUPON for your FREE COPY

Honan-Crane Corporation
1200 Sixth Street, Lebanon, Indiana

Gentlemen:

Please send me Free Copy of your booklet, "Proven Protection Against Oil Failure."

Name .....

Title .....

Company .....

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In Canada:
E. W. PLAYFORD, LTD., Montreal 28
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ALL Honan-Crane Equipment is Sold on a PERFORMANCE GUARANTEED Basis

Your Management wants to know...

The practical approach to dust abatement

PLANT ENGINEERS, working with Buell engineers, have proven again and again that their know-how coupled with Buell's long experience in Dust Collection can solve your Fly Ash problems more economically, more efficiently.

What's more, Buell Dust Collection Systems offer all American industry these further advantages: smoother plant-community relations, improved product quality and better employee morale.

Buell's knowledge and experience in the highly specialized science of Dust Collection are yours. To learn more about Buell's **3 basic systems** of Dust Collection and how they can help you, send for the new, informative booklet titled, "The Collection and Recovery of Industrial Dusts." Buell Engineering Company, Dept. 50-J, 70 Pine Street, New York 5, New York.

Van Tongeren Cyclone | 'SF' Electric Precipitator | Precipitator-Cyclone Combination | Type 'LR' Collector | Dust Hopper Valves

buell

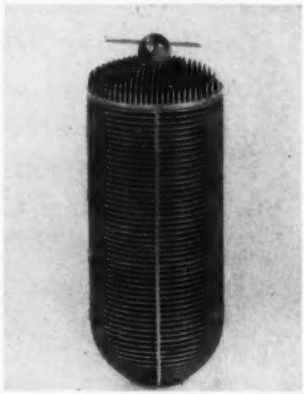
ELECTRIC CYCLONIC

ENGINEERED EFFICIENCY IN DUST COLLECTION

More EQUIPMENT NEWS

Begins on page 154

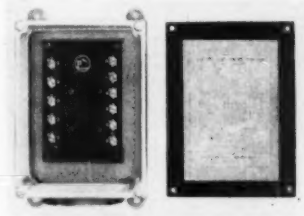
punch are provided for installing solder type lugs and splicers mechanically. Steel box carries complete instructions.
Gas Arc Supply, 223 N 16th St, Philadelphia 2, Pa.



Oil Heat Exchanger and Clarifier

P1053 • Called the J-B-99, this combination oil heat exchanger and oil clarifier is for use on heavy equipment powered by diesel, gasoline or dual-fuel engines. It has 1800 sq. in. of surface area and dissipates 5000 Btu per sq ft per hr at room temperature with no air circulation. Unit has a replaceable filter made of fibrous cellulose that will filter down to 2 to 4 microns. Made of light, die-cast aluminum alloy, J-B-99 is equipped with by-pass valve for full-flow and by-pass circulatory systems.
J-B-Engineering Co, Ltd, PO Box 521, Tujunga, Calif.

For more data on these items, use post cards p. 163. Identify request with P and number



Liquid Level Control

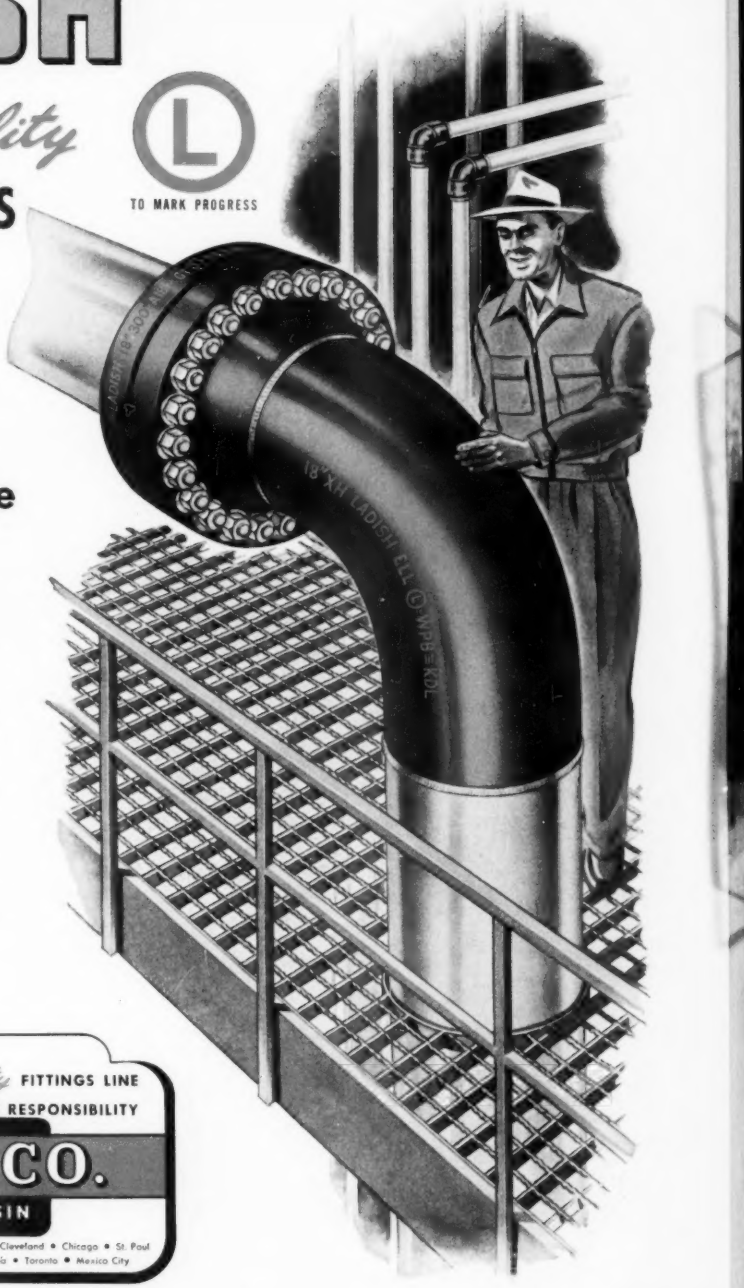
P1022 • Photoswitch liquid level control Type 10CB1 makes contact with liquid only through stainless-steel probe rods, hence is maintenance free. It has no floats, bellows or other moving parts. Available to the chemical and food processing fields, control permits selection from four sensitivity ranges to match the probe circuit to electrical resistivity of the liquid being controlled. Supplied as standard with either

LADISH

Controlled Quality

PIPE FITTINGS

TO MARK PROGRESS



metallurgically sound for maximum service

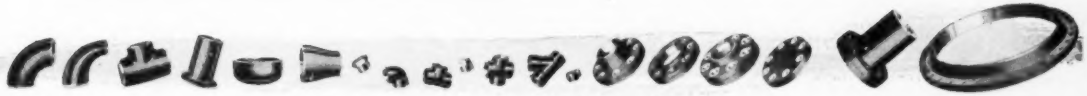
Sound metallurgy . . . the result of unsurpassed facilities and advanced laboratory controls . . . provides the maximum of dependability in Ladish Controlled Quality fittings. Every phase of metal quality . . . composition, structure and physical properties . . . is continuously safeguarded—and certified proof of metallurgical integrity is available to users of Ladish fittings.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

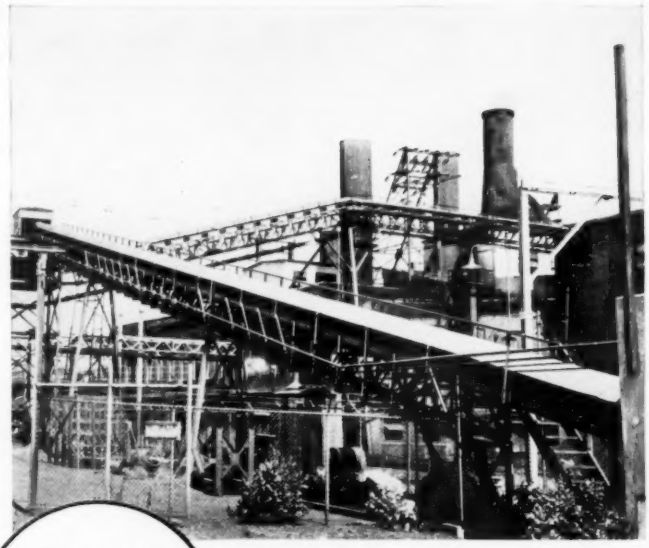
LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • Havana • Toronto • Mexico City



Coal is delivered by rail and dumped into a track hopper. A double-leg loop boot REDLER elevator lifts coal to a discharge chute which places it on a storage pile. Coal is spread and reclaimed by drag-line scraper equipment, and then transported by S-A belt conveyors to bunkers in boiler house. An S-A double extension weigh larry delivers coal to rows of boiler stokers on opposite sides of room.



S-A CONVEYING Systems

move Coal

"ON THE DOUBLE!"

From cars to storage . . . from storage to boiler house, S-A conveying equipment moves coal for this power plant . . . speedily, efficiently and at low cost per ton.

Whatever the bulk material, S-A engineers, working with a complete line of equipment units, can help you find a satisfactory and economical solution to your handling problems.

Profit by the S-A engineers' many years of experience with all kinds of conveying problems . . . write today for complete information. There is no obligation, of course.

Belt Conveyors
REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Weigh Larries
Crushers, Roll and Ring Type
Bucket Elevators
Pivoted Bucket Carriers
Screw Conveyors
Skip Hoists
Belt, Pan & Plate Feeders
Track Hoppers & Bin Gates
TELLEVEL Bin Level Controls
Water Intake Screens
SEALMASTER Ball Bearing Units

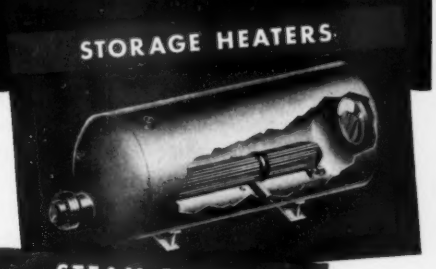
Write for a bulletin on any of the above.

STEPHEN S-A ADAMSON MFG. CO.

5 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

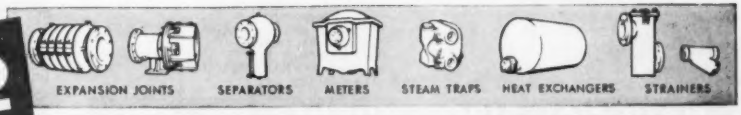
DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

ADSCO INSTANTANEOUS HEATERS

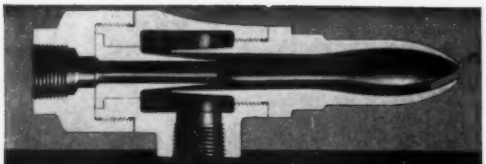


Choose ADSCO when you want a dependable instantaneous heater. For ADSCO specializes in instantaneous heaters, making all types in any size you need. Heater shells are seamless steel pipe, carefully cut and welded. Tube bundles of pure deoxidized seamless copper tubing formed into U-bends. Semi-steel covers are high-tensile, fine-grained castings. ADSCO heaters are ideal for general service hot water, process work, swimming pools, dishwashing machines... Write for ADSCO's new fact-filled, 56-page bulletin. The most complete, authoritative publication in the industry.

ADSCO
75 YEARS OF LEADERSHIP



AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK



CONTINUOUS OPERATION WITHOUT CLOGGING OR CLEANING . . .

LOW STEAM CONSUMPTION

NATIONAL AIROIL

"SA" TYPE OIL BURNER

(STEAM ATOMIZING)

The popular NATIONAL AIROIL Steam Atomizing Oil Burner *thoroughly atomizes* and *completely burns* the lowest and cheapest grades of fuel oil or tar . . . requires minimum supervision and maintenance. Only slight oil pressure and temperature is needed . . . and internal atomizing venturi feature assures *low steam consumption.* Usually as little as 1%!

NATIONAL AIROIL Type "SA" Oil Burner is adaptable to all types of industrial heating, power or process furnaces . . . is suitable for firing above stoker grates on conversion to oil.

Write for Bulletin 21.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL HEATERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
AIR INTAKE DOORS
OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES

NATIONAL AIROIL BURNER CO., INC.

Main Office & Factory: 1250 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.

Southwestern Division: 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

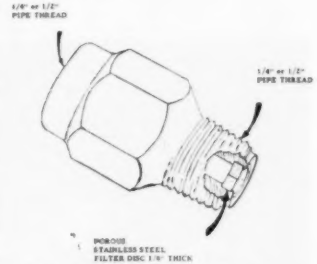
INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

More EQUIPMENT NEWS

Begins on page 154

NEMA 3 weather-resistant housing or NEMA 4 water-tight housing. Bulletin PF-479.

Photoswitch, Inc, 77 Broadway, Cambridge 42, Mass.



High-Pressure Gage Snubbers

P1054 • *Equipoise* gage snubbers that utilize a porous stainless-steel disc for damping pulsating pressures have been redesigned for high pressure service. Made in two standard sizes, ¼- and ½-in. SPT. Standard body materials are 18-8 stainless steel and brass. The stainless steel bodies are rated at 20,000 psi, and the brass bodies at 15,000 psi. Snubbers can be used as filters or as orifices to filter or maintain small flow rates.

Equipoise Controls, Inc, PO Box 269, Bronxville, N.Y.

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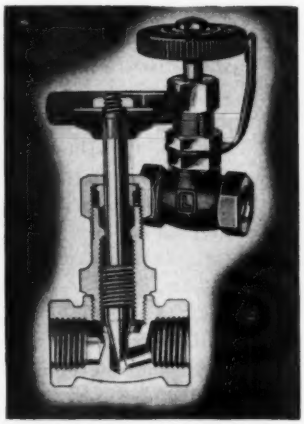


Gland-Type Needle Valve

P1024 • For fine regulation on small lines, new gland-type bronze needle valve comes in full range of sizes from ⅛ to 1 in., in both globe and angle patterns. Valve is also made in indicator model in sizes: globe, ¼, ⅜, ½ in., and angle, ¼ and ⅜ in. Cast bronze handwheel has number graduations on face. Circular 568.

Lunkenheimer Co, Cincinnati 14, Ohio

STOP VALVE LEAKAGE IN YOUR HIGH PRESSURE STEAM AND BOILER FEED LINES

Lunkenheimer Breech Lock Valves are built to control steam and water at high pressures and temperatures with absolute safety and freedom from leakage. The patented disc is flexible and resilient to assure tight seating and prevent sticking when in the closed position. The body and bonnet are locked together like the breech mechanism of a large gun. Internal pressure loads are carried by the inter-locking breech lugs, and the joint is made pressure tight by a seal weld. Gaskets, threaded rings and bolts are eliminated. The bonnet joint can be readily disassembled and reassembled.

WRITE FOR the address of your nearest Lunkenheimer representative, who will give you full details and make specific recommendations. The Lunkenheimer Co., Box 360A, Cincinnati 14, Ohio.

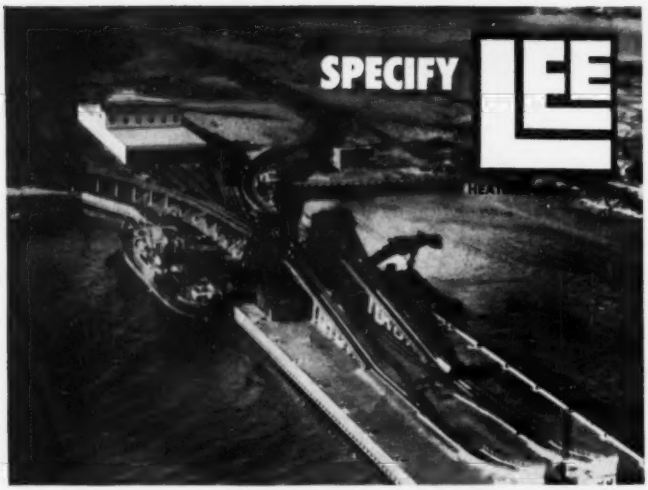
BREECH LOCK
1500 LBS. S.P.
STEEL GATE

STEEL • IRON BRONZE

★ **See our exhibit, Booth 52 at the 20th National Power Show Grand Central Palace, N. Y. . . . December 1 to 6, 1952.**

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES



FOR COAL AND ORE THAWING SHEDS

many

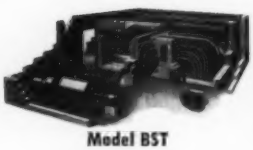
RAILROADS

specify LEE

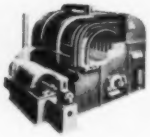
Lee Direct-Fired Heaters have efficiently serviced Thawing Sheds for 30 years giving trouble-free operation.

The skill, integrity and responsibility of the entire Lee Corporation is your guarantee of sound engineering.

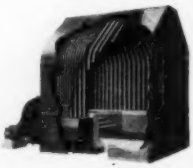
We maintain a Staff of Engineers to give you complete Lee engineering service and who will furnish data to suit your needs, promptly upon request.



Model BST



Model TSE



Model VTH

THERE'S NO HEATING OR AIR-REPLACEMENT PROJECT TOO LARGE FOR LEE HEATERS

LEE

HEATERS SINCE 1918

SPECIFY LEE the completely engineered heater

LEE CORPORATION

1011 TATNALL STREET, WILMINGTON, DELAWARE

BALTIMORE, MD. CHICAGO, ILL.

MARMADUKE

Continued from page 142

" 'Sure,' answered the operator, 'It's always the last head on this engine that cracks.'

" 'Now that's a good clue to go on,' answered the trouble shooter. 'I'll have this bull tamed in no time.'

"He replaced the cracked head as before. Then he attached thermometers on both sides of the engine, against each cylinder's water jacket.

" 'It's only a case of the last cylinder's cooling jacket being plugged or restricted. That's why she cracks,' he explained to the foreman, kinda satisfied with himself.

"He drained the radiator, filled her up with cooling water, and started the diesel. He ran the engine in that stationary position at top speed for a half hour, keeping his eyes on the thermometers. But the temperature climbed evenly on all cylinders. This had him buffaloed.

"Then he got into the operator's seat and ran the big bull over a few hills. Again he checked her. But everything seemed OK to him. He packed up and flew back home, again offering no reason for the head cracking.

"By the middle of the next week the same last cylinder's head cracked on the big bull—for the seventh time. There was so much commotion about it that I dropped everything and went for a look-see myself. The bull had been stopped on a steep grade on very sandy territory.

"I watched a mechanic replace the head while a few of the cutters and the foreman stood around. The foreman was cursing a blue streak. Then I walked around the bull and up the hill in back of it for a few hundred feet. There was a row of tiny water drops in the center of the bull's wide tread-tracks all over the hill. The drops of water led right to the bull.

" 'Mind if I do a little investigating?' I asked the foreman.

" 'Hell's bells, do anything you like,' he barked. 'But if that expert don't know what cracks those damn heads, I don't see what you can do.'

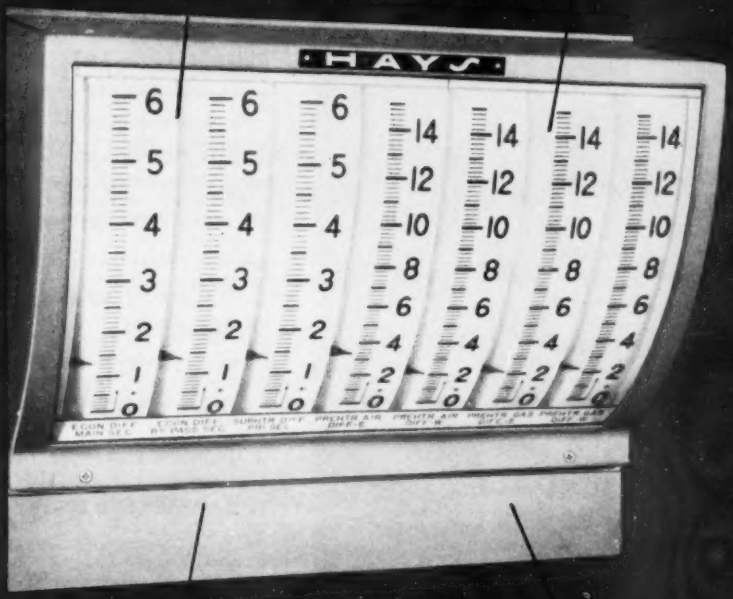
"I peeked into the radiator. While the bull was parked stern up on the hillside, the water came right up to the radiator cap. Then I had the operator level off his bull over a fairly level spot. This time the water couldn't be seen inside the radiator. I had him fill it up.

" 'All you need,' I advised the foreman, 'is to run your quarter-inch overflow tube from inside the radiator cap up a foot above the engine. Trouble is that going down grade, the water leaks out of the overflow. That robs the last

a new draft gage!

easy to remove
separate units

easy to read—
no glare, no parallax



Available in four mountings

Semi-flush mounting

Eye-level mounting

Recessed mounting

Projected mounting

easy zero check
from the front

exclusive magnetic access
door—no screws, latches, handles

the HAYS *Vertiscale*

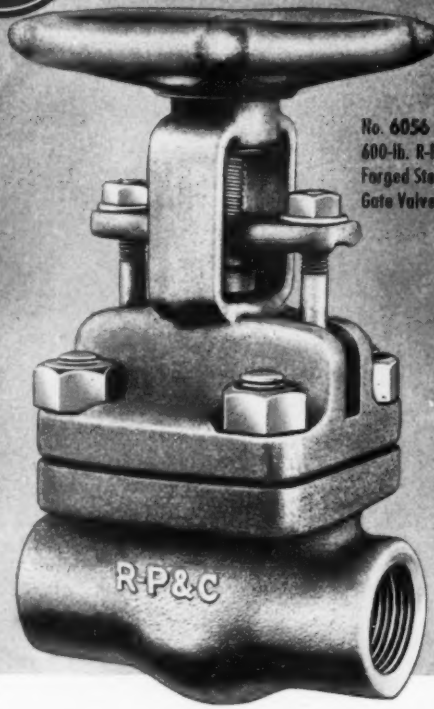
You designed this draft gage! You asked for these features!
Accessibility from the front makes possible easy "one man" method of quickly checking zero. (The fast 3-way cock with test fitting is *standard* on the Hays Vertiscale).
Simple maintenance—individual units can be quickly removed for inspection or adjustment. Removal does not affect other units in the case, does not disturb calibration of unit being re-installed.
No parallax—design eliminates reflections regardless of viewing angle.
No glare—internal fluorescent lighting is standard.
You get all these values *plus* functional styling in the Hays Vertiscale draft gage!
Write today for full information on the Hays Vertiscale Bulletin 52-1060-210.

Automatic Combustion Control
Boiler Panels • Hays-Penn Flowmeters
Veriflow Meters and Veritrol
Gas Analyzers • Draft Gages
Combustion Test Sets • CO_2 Recorders
Electronic Oxygen Recorders

THE hays CORPORATION

MICHIGAN CITY 3, INDIANA

an ACCO product



Premium Quality Features

● Body, bonnet, yoke, wedge, and hand-wheel of this sturdy R-P&C Gate Valve are forged steel. Wedge is heat-treated. Seating surfaces are smoothly ground and chromium plated for near diamond hardness. Stainless steel swinging gland eyebolts and nuts won't corrode or freeze. Furnished in ¼" to 2" sizes. Screwed, flanged, or welded end.

It's a premium quality valve but NOT premium priced. See your R-P&C distributor or write nearest R-P&C district office.

ACCO

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R-P&C valves

cylinder's jacket of water so only the last head cracks.'

"The foreman was too dumbfounded to say anything. But it sounded like horse sense to him. He had that simple change made on the big bull and on all the other bulldozers for good measure. And that was the last time a head cracked while I was there.

"That expert's trouble shooting reminds me of the sailor who boasted he had gotten the Peruvian itch eighteeen times," wound up Marmaduke. "Only trouble was he had it cured every time but the first time."

REMODELED PLANT

Continued from page 89

Fig. 2 shows a horizontal-shaft high-speed exciter geared to the shaft of a vertical 5000-kva 6300-v generator. Speed is first stepped up about 4 to 1 through a pair of vertical-shaft gears. The drive then changes from vertical to horizontal through bevel gears, which again about doubles the speed. Housing for the spur and bevel gears is supported from the generator's guide-bearing spider. Driving the exciter mechanically from the generator shaft not only reduces the headroom required for the machine and allows operating the exciter at the most economical speed but also makes it possible to put the machine in service when no outside source of excitation is available.

This generator is also driven by a kaplan propeller turbine. An unusual feature of this wheel is that the speed-ring guide vanes and the gates are set at an angle of about 30 deg to the vertical. Normally, water after passing through the guide vanes and gates turns 90 deg to go down through the wheel. In the arrangement, Fig. 2, it has to turn about 60 deg to go through the wheel. Of course, a more complicated gate-operating mechanism is required than when the gates are vertical.

pH CONTROL

Continued from page 79

no further checking of condensate or addition of amine would be necessary on their shift.

As a result, pH of the condensate not only varied considerably from operator to operator, but a large amount of amine was wasted and, at the higher pH values that resulted (up to 9.0), corrosive ammonia was found in the water columns. Even under the best conditions when using phenolphthalein, an excessive amount of amine would be added, since the phenolphthalein color change occurs at about 8.3 compared

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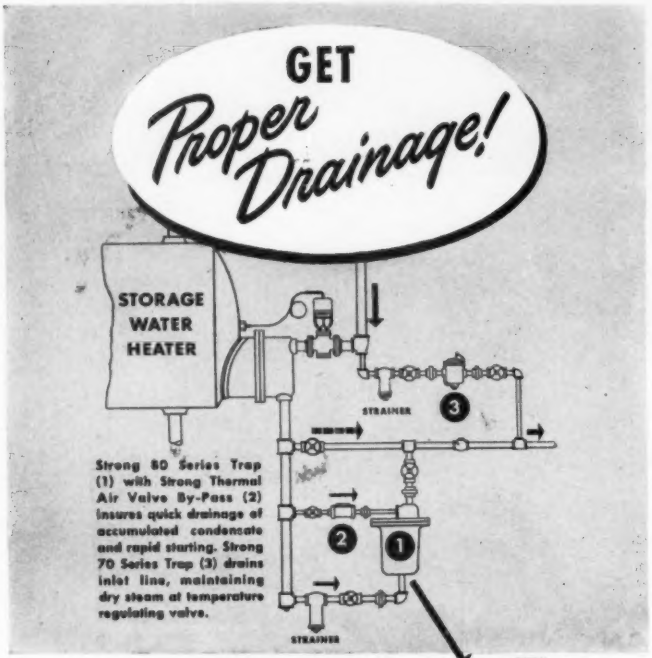
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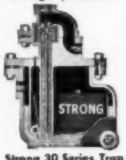
Strong 80 Series Trap (1) with Strong Thermal Air Valve By-Pass (2) insures quick drainage of accumulated condensate and rapid starting. Strong 70 Series Trap (3) drains inlet line, maintaining dry steam at temperature regulating valve.

PROBLEM: Condensate accumulates in coils due to lack of pressure when thermostatic regulating valve is throttling or closed. *Improper drainage and water hammer result when thermostatic valve opens.*

SOLUTION: *Drain coils fast.* Use trap with four to eight times capacity of actual steam condensate rate. For medium or high pressures, either open or inverted bucket traps are suitable. *Use open bucket traps for low pressures.*

Completeness of the Strong trap line enables our engineers to recommend exactly the type or size you need—open or inverted bucket, closed float, float-and-thermostatic (blast), etc., forged, welded, cast or semi-steel construction. Bring your drainage problems to us for solution. Send for Strong Trap Catalog No. 68-P today for complete details of all Strong traps.

Strong 80 Series Trap for medium or high pressures.



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OTHER STRONG STEAM SPECIALTIES

Reducing Valve

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STRONG

pH CONTROL

Continued from page 188

to the chosen control range of 7.2 to 7.6 pH. We thus had to consider this type of control unsatisfactory.

Continuous Checking. The answer for proper control of condensate pH proved to be precise, continuous pH measurement. Arrangements were made for installation of a Beckman automatic pH indicator (Model R) and a Bailey circular-chart recorder connected to the Beckman indicator, Fig. 1, 2, 3.

A standard glass electrode and reservoir reference electrode were installed in a Beckman flow chamber, together with a resistance thermometer to compensate for thermal changes. A line was taken off the hotwell-pump discharge and a stainless-steel orifice, made with a No. 60 drill, reduced pressure. This allowed a free and steady flow through the electrode flow chamber without valves or a pressure reducer and, at the same time, cut the pressure down from 100 psi to simplify installation and equipment operation, Fig. 1.

It is a matter of theoretical interest as to what the hydrogen-ion concentration may be at elevated temperatures and pressures, but from a practical point of view, if good correlation can be obtained between operating experience and continuous evaluation of samples at low temperature and pressure, a much more troublefree system of pH testing can be maintained.

With the installation of automatic pH equipment, several rather surprising facts were at once apparent. It was found that pH of the condensate water would readily respond to additions of as little as 20 ml of the amine, where 200-ml "slugs" had been used before. Also the extraordinary speed of circulation of amine in the boiler system was shown; pH of the condensate water increased almost immediately after amine additions made at a remote inlet to the boiler, Fig. 5. In short, we found the process control substantially improved.

One of the puzzling effects observed soon after the pH equipment was installed was a "flutter" or "hunting" of the meter needle and recorder pen. After some study, we found this was due to the nature of the condensate water itself. Condensate from the steam turbine represents the purest water in the whole steam system. Even the slightest change in acidity or alkalinity of water near the neutral range of pH 7 would cause changes in the electrode system. Because of the sensitivity of the Beckman pH indicator and the Bailey recorder, these rapid changes were actually being recorded. An alteration in one of the components of

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Wallace & Tiernan equipment because it is versatile, sturdy and dependable — proven by thousands of successful installations, vouched for by satisfied users everywhere-and because there's a Wallace & Tiernan chlorinator for every job. Write today for information on how Wallace & Tiernan chlorination may help you solve *your* slime problem.

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regardless of the source. Chlorination helps reduce slime in make-up or cooling water.

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CHLORINE AND CHEMICAL CONTROL EQUIPMENT
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pH CONTROL

Continued from page 190

the pH instrument's electronic circuit gave the desired "flywheel" effect and ironed out the curve on the recorder chart.

So far the equipment has required only nominal maintenance. The Bailey recorder requires a chart change once in 24 hr, while the routine for the Beckman pH meter calls for buffer standardization once a week. Since extremely pure water is known to be corrosive to glass, we feared at first that the glass electrode for the pH flow chamber might need frequent replacement. We found the contrary to be the case. The original electrode pair installed continue in service after two years with no apparent deterioration. And the pH indicator shows no significant drift from week to week. Fig. 4.

Advantages of the continuous pH measuring and recording installation have proved to be (1) reduction in corrosion—which would otherwise require costly shutdowns and frequent maintenance—by enabling close control of system pH (2) more efficient operation since the heat exchangers remain free of any insulating deposits (3) reduction by a factor of ten in the amount of amine required to maintain the pH at proper value (4) a permanent record of operation, showing deviations from normal from any cause, as well as showing when the amine was added and which shift added it (5) greatly simplified control since no color judgment by operators is called for, and (6) opportunity to add control feed valves if automatic process control should be desired.

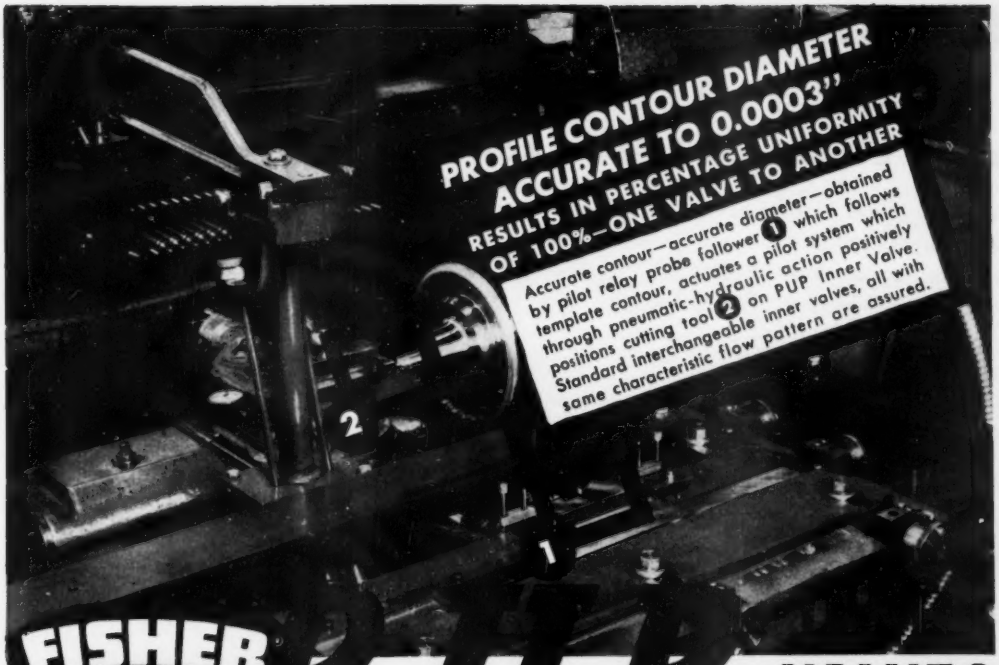
DIESEL NOISE

Continued from page 84

need periodic maintenance for topnotch continuous performance. Fouled heat-transfer surfaces in waste-heat mufflers and boilers may have worse effects than in standard boilers because entering gas temperature is lower. Don't neglect feedwater treatment because steam pressure is low. Treated water lengthens unit life, cuts maintenance.

Where engines exhausting through waste-heat boilers do not run continuously, consider an auxiliary burner. Then you can generate steam when engine is shut down. Run boiler as you would any other similar steam-generating unit, observing special recommendations of manufacturer.

Don't let rain water accumulate in idle mufflers. It can cause serious corrosion problems. Be especially careful to stop water leaks in heat-recovery mufflers as soon as discovered.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ACCURATE TO 0.0003"
RESULTS IN PERCENTAGE UNIFORMITY
OF 100%—ONE VALVE TO ANOTHER
Accurate contour—accurate diameter—obtained by pilot relay probe follower 1 which follows template contour, actuates a pilot system which through pneumatic-hydraulic action positively positions cutting tool 2 on PUP Inner Valve. Standard interchangeable inner valves, all with same characteristic flow pattern are assured.
2
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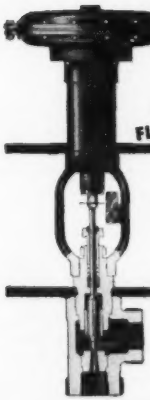
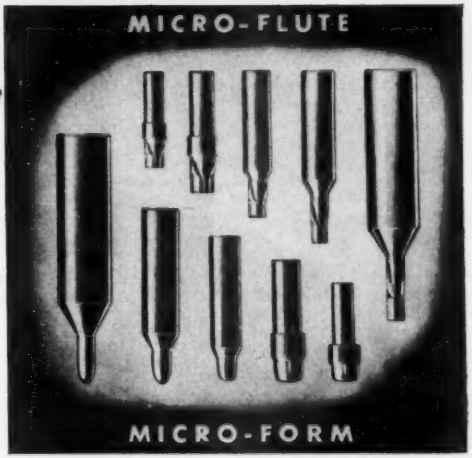


Type 57T-DA direct acting diaphragm motor valve showing Micro-Form Pup in Fisher high pressure cast steel Design "D" angle body.



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Excellent acceptance, phenomenal service and extremely satisfactory performance—that's the 6 year record of FISHER PUP INNER VALVES.

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Niagara's HYGROL DRIES AIR BEST

with exact moisture content

- to control your product's quality
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- to protect your material from dampness
- to protect your processing of moisture-sensitive material
- to DRY your material or product
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- to get exact moisture control for the precise atmosphere condition you need
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The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

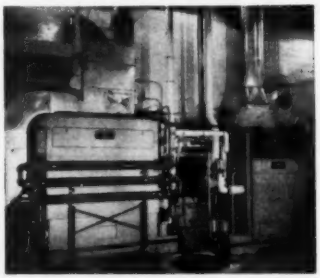
Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.



Niagara Controlled Humidity Air Conditioning

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

For complete information write

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More PLANT PROBLEMS

Begins on page 130

Oil in Condensate (cont from p 131)

stand pipe. Draw oil off through scum connection at liquid level.

Clean condensate passes to tank bottom and then rises to top of internal overflow probe. Bottom of probe connects to a vented receiving tank.

Sight glass shows when there is oil in the tank. Or an alarm hooked to a conductivity meter can be used.

R LISSON *New York, N. Y.*

PHOTOELECTRIC CELL and control is efficient and foolproof. This equipment can be set up to automatically dump contaminated condensate to sewer.

Simple earth filters are available that give good results at low cost.

L W FITZPATRICK *Jefferson City, Mo.*

DUMP RETURNS to sewer until leaking coil is found. Repair coil and install controls to automatically test condensate before it reaches your pump.

J P DEMAS, SR. *Roselle Park, N. J.*

DON'T STOP feedwater treatment as soon as oil is cleared up by using grease extractors or feed and filter tank. *HF* may think all oil is out of pipes and boilers but he can't be sure for several months or more.

H W CONGDON *Auburn, Mass.*

Chemical Cleaning (cont from p 134)

FEED TREATMENT that prevents scale before it forms is better than treatment after it forms. *RP* should have his boiler water analyzed to see if suitable treatment can be worked out. Our old plant gave us all kinds of headaches because we didn't treat water correctly. Now, in our new plant using the same water, we have no trouble at all because the raw water is properly treated before it enters the cycle.

ARTHUR BELTON *Montreal, Can.*

CHECK WATER treatment before acid-cleaning a boiler. You may find that neglect of this treatment has caused scale buildup. Clean your boiler tubes annually by turbining. This can remove both scale and corrosion products.

Circulate trichloroethylene through fuel-oil heaters to clean them. Carbon tetrachloride may also be used but it is only about half as efficient.

J F DOYLE *Bronx, N. Y.*

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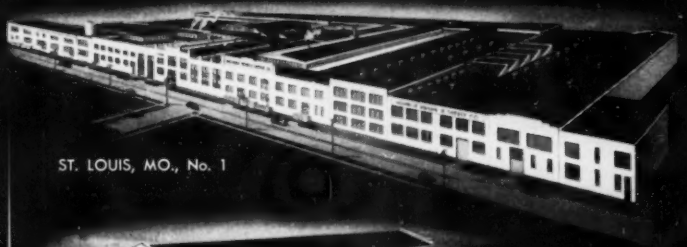
Multiple Advantages from MIDWEST Multiple Plants



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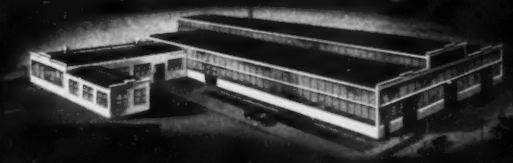
LOS ANGELES, CALIF.



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• REMOVES WATER, SLUDGE, ACIDS
• IT IS CONTINUOUS AND AUTOMATIC

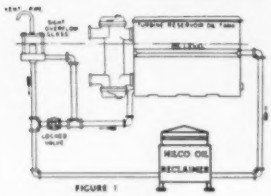


FIGURE 1

• The HILCO system results in removing contamination as fast as it is formed, thus maintaining the oil in first class condition.

• The HILCO OIL RECLAIMER is self-contained, including built-in pumps, electric heaters, starters and controls. It is compact, easy, and quick to service.

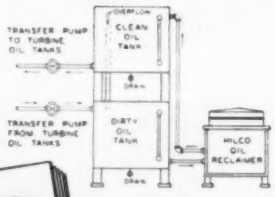


FIGURE 2

FOR MORE INFORMATION ON THE HILCO SYSTEM

to do to operate the equipment properly.

We decided that in general the engineers would prepare the first type of instruction, since the plants were designed and the equipment purchased by them. They also were the specialists who knew most about the equipment. Preparation of specific operating instructions was assigned to operating people at each plant. We felt that those having day-to-day experience with the machinery were most competent to handle this phase of the program.

In addition to these main instructions were two others: (1) brief description of a steam-electric power plant to aid in orienting new employees with little or no previous knowledge of a modern generating station and, (2) brief description of the major equipment in each plant such as capacity of the turbine-generators and boilers, the pressures, temperatures, voltages, etc. in use. This would give the beginner a quick overall picture of his particular plant. These brief descriptive write-ups are in the form of brochures with 4 to 10 pages.

We obtained unexpected response from the first of these booklets, *A Trip Through a Steam-Electric Power Plant*. Although intended primarily for our plant employees it was also distributed to visitors, in the main a non-technical audience. To foster good public relations, thousands of such people were invited to our plants and they found the booklet helpful in understanding the complex machinery. Many requests for this brochure came also from other utilities, individuals and even from insurance and financial institutions. *ASME paper. No. 52-SA-45.*

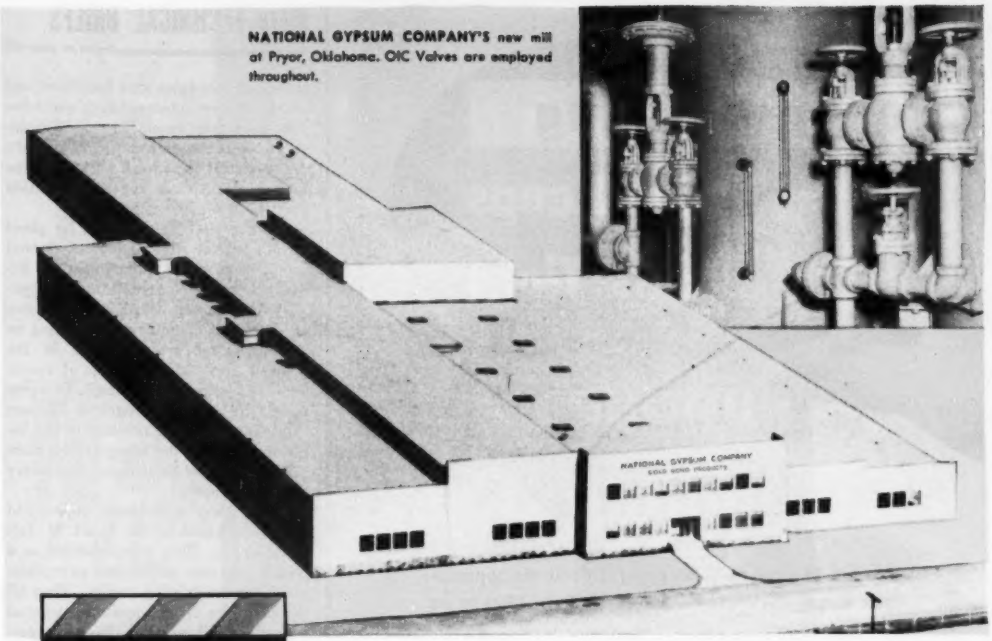
Training an Operating Group for a Second Generating Station. *By J D Williamson, Dayton Power & Light Co.*

Staffing a new generating station can be a simple matter of selection if the field available is large. With several existing stations, men of established ability can be assembled into a first class group without seriously impairing the various units of the combined operation.

However, when the new station is only the second, and the entire staff must come from a group that has not completely recovered from the strain of wartime depletion, it becomes a problem of major proportions.

During World War II the personnel of our one existing station had been depleted so that several twelve-hour.

Directions for ordering papers on p 152



NATIONAL GYPSUM COMPANY'S new mill at Pryor, Oklahoma. OIC Valves are employed throughout.

BUILD BETTER WITH
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In line with their policy of placing plants within important market centers, National Gypsum Company has recently added this "push-button paper mill" at Pryor, Oklahoma. Here wastepaper is converted into a bonded eight-layer sheet for lining Gold Bond gypsum board, lath and sheathing.

Also conforming to their policy of using the highest quality products in their construction, OIC Valves were used at this new mill. OIC Valves are *precision engineered* and *precision built.* OIC engineers offer you *precision application* help.

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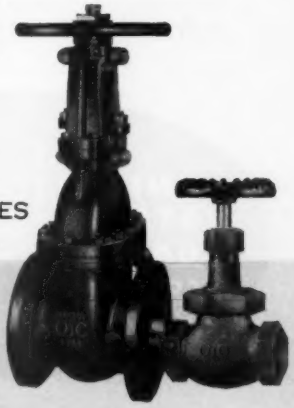

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VALVES

FORGED AND CAST STEEL • IRON • BRONZE

Try this. Bend an ordinary paper clip into the approximate shape of a cross-section of the metal pies in an Ajax Spiralwound Gasket.

Now squeeze it between your thumb and forefinger. You can feel the resiliency that lets these gaskets breathe with varying pipeline and boiler stresses. That offers safer seals at lower bolt loads. That allows the gasket to conform to warped or badly pitted flange surfaces. That usually permits an Ajax Spiralwound Gasket to be reused, should it be necessary to part the joint.

Specify this "Spring-Loaded" gasket for real gasket performance and economy. Types for all standard pipe flanges; boiler manhole, handhole and tube caps; waterwalls, economizers and pressure vessels of all sorts.

Sold universally through industrial distributors. Ask yours about them or write—

UNITED STATES GASKET COMPANY

FABRICATORS OF "TEFLON" & "KEL-F" FOR THE CHEMICAL PROCESS & ELECTRONIC INDUSTRIES

CAMDEN 1 NEW JERSEY

More TECHNICAL BRIEFS

Begins on page 150

seven-day schedules were instituted, and vacations were postponed. Twenty-five new operating employees, a 50% increase, were required to permit a return to the normal 40-hr work week. Not one was experienced in generating station work.

Early in 1947 we started to lay plans for staffing the new station. A normal complement of five trained men was believed sufficient to operate the first section of the station. A sixth man, known as apprentice operator and requiring no prior training, was included in the planned crew. A supervisor of operations was also to be trained. To cover three-shift operation required 21 men trained to take over the station for initial starting. By the laws of Ohio, eight of these had to be licensed Stationary Steam Engineers.

As the first step, some twenty-odd men were added to the Frank M Tait Station rolls. They were intended as a pool for the new station, and as replacements for the existing station. Then all the men were divided into three general groups, as follows: (1) those who preferred the new location; (2) those who had no preference; (3) those who wished to remain at Frank M Tait.

We filled our needs from groups 1 and 2. Tentative selections were made and those chosen were assigned, as nearly as practicable, to the type of work they would do in the new station. *ASME paper. No. 52-SA-47.*

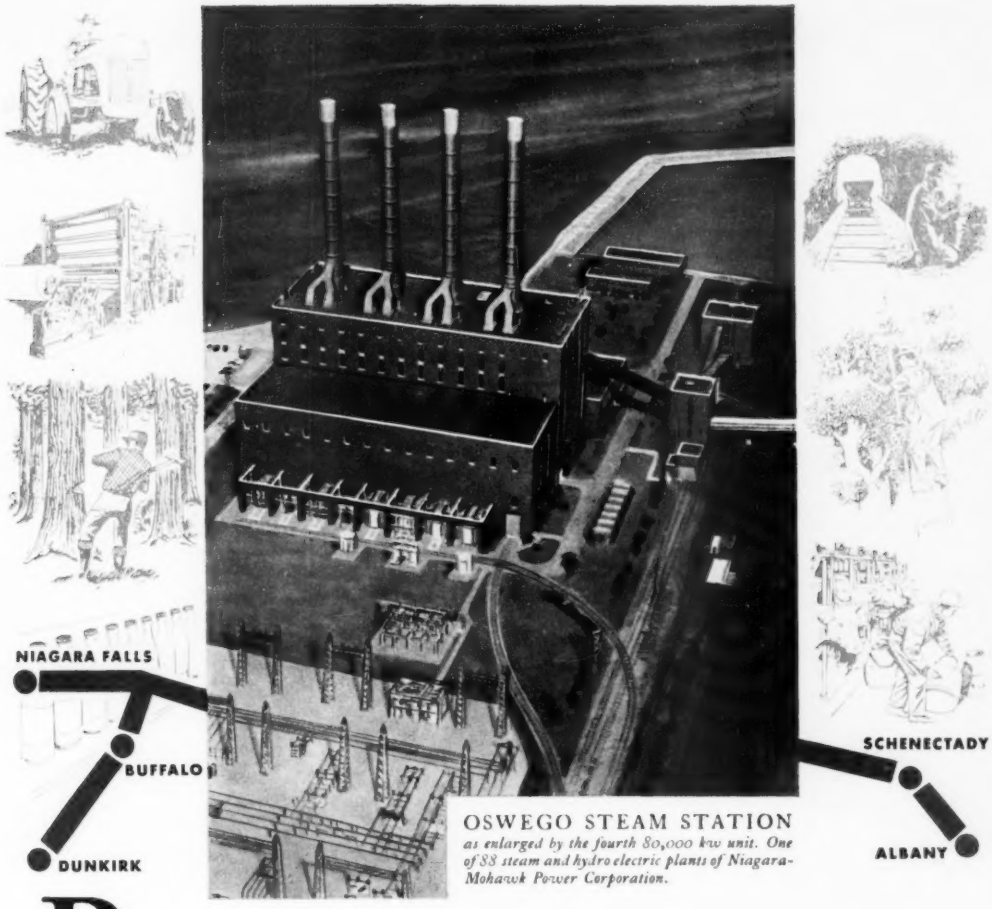
Directions for ordering papers on p 152

Selecting and Training Personnel for Centralized Control Power Station. *By F E Nicoson, Public Service Co of Indiana.*

One of the first steps in formulating plans for manning a new centralized control station is to prepare an initial outline of the organization. With knowledge of various job duties in existing stations, study the new design and determine the general differences in the grouping of duties. You must consider supervisory as well as non-exempt jobs. Obtain as much information as possible from other companies regarding their experience in setting up similar organizations. Then calculate the number of employees for each classification.

With the outline prepared, write up job descriptions and assemble job data for job evaluation. Of course, where union agreements are in effect, arrangements must be made for at least tentative evaluated rates of pay to be set before you solicit and select employees.

The supervisory staff should be



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as enlarged by the fourth 80,000 kw unit. One of 88 steam and hydro electric plants of Niagara-Mohawk Power Corporation.

PRIVATE ENTERPRISE *In Action*...

The Niagara-Mohawk Power Corporation has 7000 circuit-miles of transmission lines and 85,000 conductor-miles of distribution lines in upper New York state. Its entire system has a rated capacity of 2,186,451 kw with 600,000 kw now under construction.

A current example of their enterprise is the Oswego Steam station, designed by their engineering department with construction supervision by Stone & Webster Engineering Corporation.

The benefits of competent business management of a privately-owned utility are again demonstrated by the Niagara-Mohawk system.

STONE & WEBSTER ENGINEERING CORPORATION

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Straight Tube
U-Tube
Horizontal
Vertical
Condensing
Subcooling
Desuperheating
High Pressure
Low Pressure
Large Capacity
Small Capacity

at our finger-tips

the right feedwater heater design for your needs

No matter what may be your capacity needs, your boiler pressure, your plant heat balance, or your special operating conditions, you can be sure that G-R can supply a practical, effective design of feedwater heater precisely suited to your needs.

That's because of the 65 years of G-R experience in building feedwater heaters, throughout which the G-R designs have been steadily developed to keep abreast of advances in steam plant practice.

And here's another important result of this unequalled G-R experience . . . the many proven exclusive design features that assure long, economical service as well as highly efficient heat transfer.

Write for bulletin describing in detail the many types and advantages of these units.

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO

G-R HEAT TRANSFER APPARATUS *Feedwater Heaters*

GR 292

Who put the windows in Bus Conductors?

The "windows" are ventilating holes which Chase engineers put in to aid the dissipation of heat. They increase the current carrying capacity about 20% over unventilated tubes. And a ventilated square tube bus conductor means saving up to 36% in the weight of copper used.

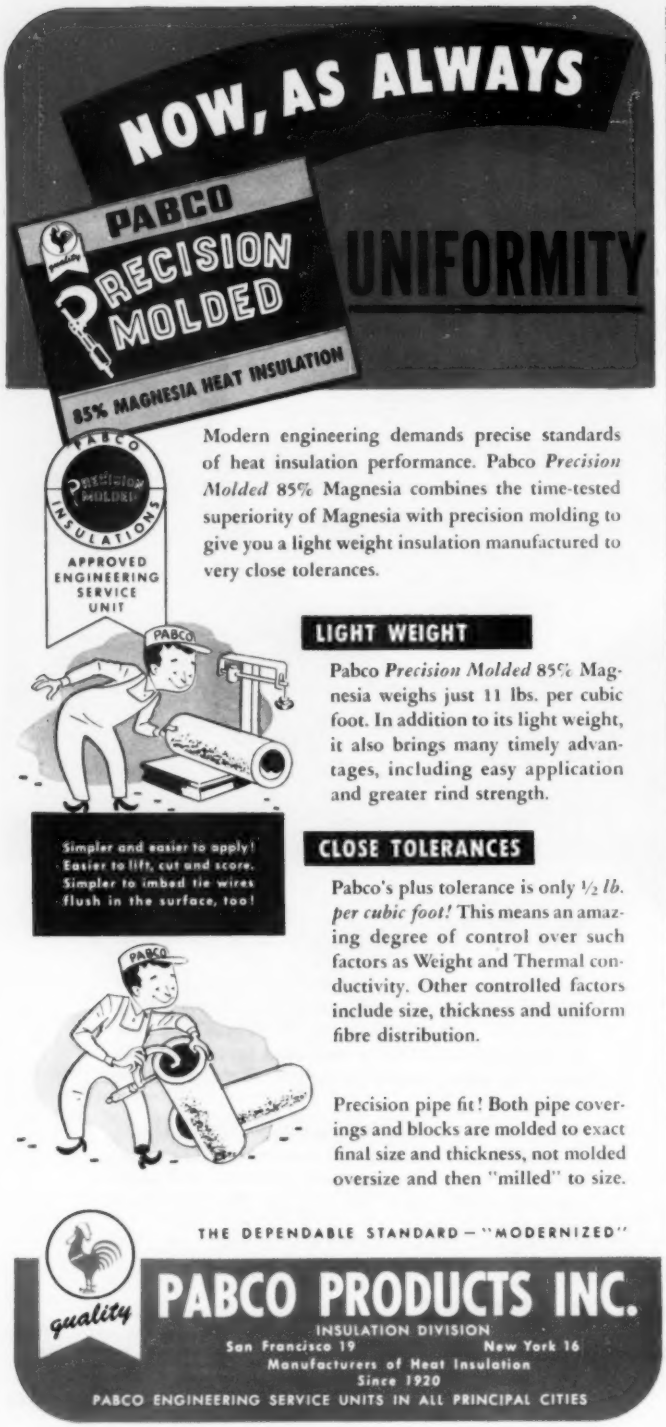
When you add to this high mechanical strength, ease of assembly and erection and resistance to corrosion, you'll agree that Chase square copper tube conductors are ideal. Write Dept. PO 1052 for the Chase Bus Conductor Handbook.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	


NOW, AS ALWAYS
PABCO
PRECISION MOLDED
UNIFORMITY
85% MAGNESIA HEAT INSULATION
PABCO
PRECISION MOLDED
INSULATIONS
APPROVED ENGINEERING SERVICE UNIT
Modern engineering demands precise standards of heat insulation performance. Pabco *Precision Molded* 85% Magnesia combines the time-tested superiority of Magnesia with precision molding to give you a light weight insulation manufactured to very close tolerances.
LIGHT WEIGHT
Pabco *Precision Molded* 85% Magnesia weighs just 11 lbs. per cubic foot. In addition to its light weight, it also brings many timely advantages, including easy application and greater rind strength.
Simpler and easier to apply!
Easier to lift, cut and score.
Simpler to imbed tie wires flush in the surface, too!
CLOSE TOLERANCES
Pabco's plus tolerance is only ½ *lb. per cubic foot!* This means an amazing degree of control over such factors as Weight and Thermal conductivity. Other controlled factors include size, thickness and uniform fibre distribution.
Precision pipe fit! Both pipe coverings and blocks are molded to exact final size and thickness, not molded oversize and then "milled" to size.
THE DEPENDABLE STANDARD — "MODERNIZED"
quality
PABCO PRODUCTS INC.
INSULATION DIVISION
San Francisco 19 New York 16
Manufacturers of Heat Insulation
Since 1920
PABCO ENGINEERING SERVICE UNITS IN ALL PRINCIPAL CITIES

More TECHNICAL BRIEFS

Begins on page 150

formed first, as selection of the best available personnel for this group insures the foundation for a good organization. Since there will be very few candidates with all around station experience because of older station specialization in either boiler work, turbine work or electrical work, the people selected should be those with maximum potential ability. They must possess individual initiative, aptness and ambition because it will require a great deal of study on their part to readily absorb the phases of operation in which they are inexperienced. These key people should be located in the new station at least six months prior to the start-up.

Selection of key non-exempt or physical employees is of almost equal importance. The means of selection and transfer of employees from existing stations becomes an individual company problem since union agreements, factors considered in promotions and housing difficulties are some of the hurdles that must be overcome. Again, however, where experience may be lacking, the individual's potential ability should be the prime factor in influencing the choice of people for the higher skilled job classifications.

It may be necessary to fill the lower classification jobs from personnel outside of the company, in which case they should be available one to two months prior to initial operations. *ASME paper. No. 52-SA-48.*

Air Pollution

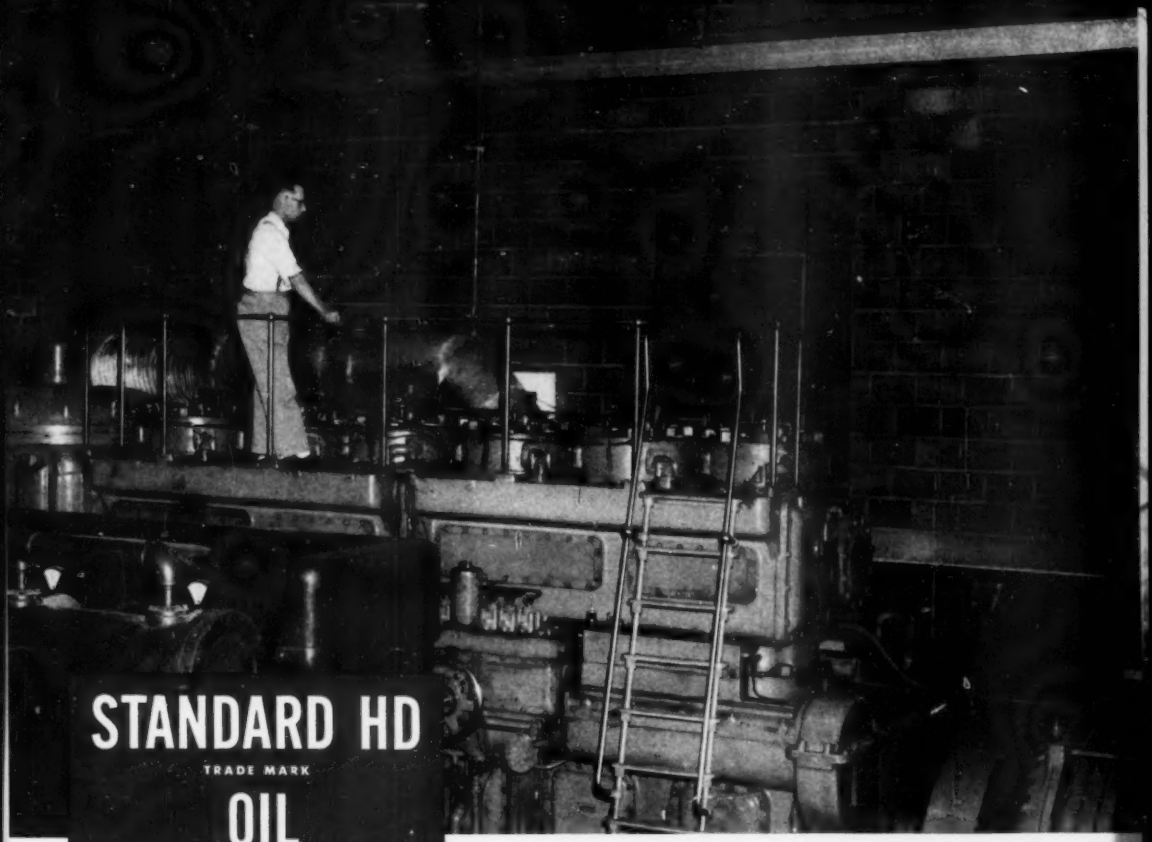
Eye Irritants in the Atmosphere. *By E M Adams and E J Schneider, Dow Chemical Co.*

The authors' plant experienced rapid expansion in production of old line chemicals as well as introduction of entirely new processes, several based on ethylene. Inter-plant complaint terminology changed suddenly from "stink" to "tear gas," in spite of extended previous experience with chlorine, bromine, methyl chloroacetate, and other substances that are all known tear-producers. These known irritants failed to demonstrate a cause for the complaints. Unquestionably a "newcomer" was in the air.

Field tests with free halogen and pure styrene confirmed that a vicious eye irritant was formed by interaction of these two substances in the air.

Under existing conditions the quickest solution was eliminating the source

Directions for ordering papers on p 152



Doubles time between overhauls

• In the case of this 1028 HP diesel serving a midwestern municipal power station, excessive operating and maintenance costs were a serious problem . . . until a Standard Oil lubrication specialist recommended changing to STANDARD HD Oil and STANDARD Diesel Fuel.

Here's the situation today, in comparison with the results which plant operators were getting with a conventional lubricant:

Ring sticking, ring breakage, and carbon deposits have been eliminated.

Ring replacements have been reduced from 80 to 18 per year. Cylinder wear has been cut from .003" per 1000 hours to a maximum of .003" per 5000 hours.

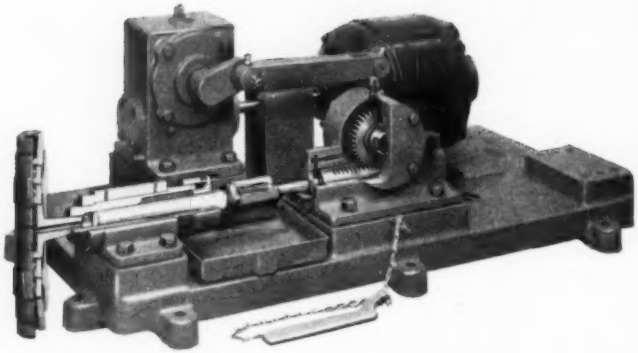
Time between overhauls has been extended from 2500 hours to 6000 hours and longer.

Lubricant consumption, formerly averaging one gallon per 1192 KW generated, now averages one gallon per 1535 KW generated. Fuel consumption, which had averaged 12.28 KW per gallon, now averages 13.50 KW per gallon.

A Standard Oil lubrication specialist can help you develop a similar "before and after" situation in the operation of your own diesels. For his services, and his recommendations, simply call the Standard Oil Company office in your own area. Or write: Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Illinois.

STANDARD OIL COMPANY STANDARD *(Indiana)*

For continuous, precisely controlled injection of boiler feed water treatment



. . . the HILLS-McCANNA "U" Type Proportioning Pump

The Hills-McCanna "U" Type Pump is designed to continuously meter and proportion small flows of the order of 0.10 to 24 gallons per hour per feed. Its accuracy and reliability ideally suit it for power plant applications such as the continuous injection of internal phosphate treatment and sodium sulphite oxygen scavenging in feed water treatment. Design of the pump is such that it may also be used for batch operations where this is preferred.

The "U" Pump is ruggedly and simply designed for long, dependable service and is furnished as a "packaged" unit, complete with motor, drive and pump mounted on a common base. Available with one to four feeds.

The new "U" Pump Catalog, UP-52, gives full information on the "U" type pump plus extensive application data including specific service recommendations for handling over 300 substances. Write for your copy, today. HILLS-McCANNA CO., 2369 W. Nelson St., Chicago 18, Ill.

HILLS-McCANNA

metering and proportioning pumps

Also Manufacturers of: Saunders Patent Diaphragm Valves Force Feed Lubricators • Magnesium Alloy Sand Castings

More TECHNICAL BRIEFS

Begins on page 150

of styrene. Corrective measures fell into two general categories: (1) Plant changes consisting of improved operation and mechanical alterations to reduce the loss of styrene into the sewer. (2) Decontamination of the waste water by simple blowing with air. In addition, certain sources of halogen other than the magnesium cells were eliminated or minimized. *APSPAA paper. No number.*

Air Pollution Abatement in Steel Industry. *By C A Bishop, United States Steel Corp.*

The metallurgical industries carry out a large variety of chemical and physical processes at high temperatures. These high temperatures mean that something is being burned, and that leads to the problem of air pollution.

To appreciate the size of the problem consider the amount of fuel used by steel plants. The industry's possible requirements for fuel in a year are over one billion gallons of fuel oil, several hundred billion cubic feet of natural gas, 17 million tons of coal burned in boiler houses, and 94 million tons of coal required to supply coke for blast furnaces.

First approach to bringing this industry and its air pollution under control was a study of dust loading throughout the various periods of melting and refining in the open hearth. The method used for sampling the dust loadings is a modified Brady method, which involves filtering a metered volume of gas through a paper thimble. From the change in weight of the thimble for a given amount of gas, the dust loadings can be calculated.

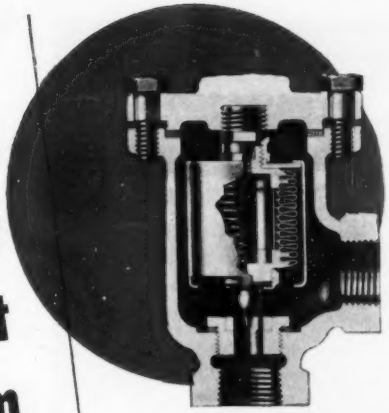
Because dust loadings vary appreciably during the course of the heat, a sampling program had to be developed to properly represent the conditions. The heat was broken down into six periods: the melt down, hot metal addition, ore boil, lime boil, working heat, and empty furnace.

A study of the particle size of the material collected has shown that approximately 50% by weight of the dust from an oil-fired open hearth is smaller than 5 microns, with only a few per cent above 20 microns. Many particles smaller than one micron are present. The smallest individual particles visible to the naked eye are about ten microns in size; the minute particles in cigarette smoke are about 0.1 to 0.2 microns.

As soon as the study of open hearth dust loadings at the various open hearth shops with their different methods of

Directions for ordering papers on p 152

"you can't beat them for PROCESS EQUIPMENT"



Sarco Balanced Pressure Thermostatic Steam Trap No. 9, available in sizes ½" to 2" for pressures to 300 psi. Ideal for individual trapping of process equipment.

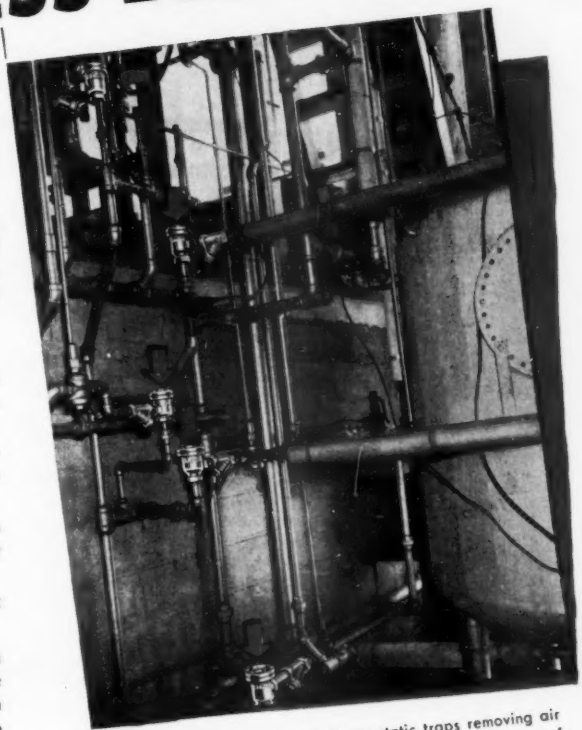
. . . says Mr. Paul H. Todd, owner of Farmers' Chemical Laboratories, Kalamazoo, Mich.

● MR. TODD has reference to the Sarco Balanced Pressure Thermostatic Steam Traps used throughout his efficient plant, equipped with the finest of modern processing machinery.

He selected Sarco No. 9 because:

1. Highest capacity per dollar cost.
2. The large discharge valve is wide open when the trap is cold, assuring rapid air venting for quick starts from cold.
3. Small size, low first cost and minimum maintenance make them ideal for individual trapping (a trap on every coil).
4. No adjustments or valve and seat changes are necessary when pressures change. Fewer spare parts to stock.
5. Requires no special protection against freeze-ups when installed outdoors.

For full information write for free Bulletin 250-14 to Sarco Company, Inc., Empire State Bldg., New York 1, N. Y., Represented in principal cities. Sarco Canada Ltd., Toronto 8, Ont.



Sarco balanced pressure thermostatic traps removing air and condensate from steam coils and supply lines of large vacuum still with reflux column and condenser at plant of Farmers' Chemical Laboratories, Kalamazoo, Mich.

SARCO saves steam

improves product quality and output

429

SPECIALLY DESIGNED
for
EASIER INSTALLATION
and
LONGER SERVICE

Fig. 0611, IBBM Wedge Gate Valve, Working Pressures: 125 lbs. Steam, 200 lbs. WOG.

KENNEDY JOB-FITTED
Iron-Body Wedge Gate Valves

YOU SAVE TIME AND MONEY all along the line with Kennedy iron-body wedge gate valves because they are JOB-FITTED . . . every valve specially designed and engineered for the job it has to do.

THE WEDGE DISC is a cored casting of thick metal section, reinforced by integrally-cast interior posts and provided with openings to drain in any position.

HEAVY BRONZE DISC RINGS are forced into dovetailed grooves in the disc in a practically inseparable construction.

HIGHER STRENGTH IRON in the body and bonnet is actually 50% stronger than ordinary cast iron . . . and far exceeds A.S.T.M. requirements.

ALL CONTACT SURFACES between moving parts are bronze-to-bronze to assure easy operation.

RUSTPROOFED STEEL BOLTS AND NUTS have ample clearance to prevent distortion. Open-end wrenches may be used . . . no need for special tools. Valves can be repacked under full pressure.

EVERY FEATURE of the valve helps it do the job better . . . gives you a solid guarantee of economy and dependability whenever you install one of these Kennedy Job-Fitted Wedge Gate Valves.

BUY FROM YOUR LOCAL DISTRIBUTOR

WRITE FOR BULLETIN 107

Est. 1877

THE KENNEDY
VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

More TECHNICAL BRIEFS

Begins on page 150

operation was completed, an investigation of equipment to control the emissions was undertaken.

The fact that there is a large percentage of fume present in the stack gases from an oil-fired open hearth indicates that either an electrostatic precipitator or a high-energy requirement wet washer will be needed to reduce the solid content of the stack emission by more than 50 to 60%. *APSPAA paper. No number.*

Series Dust Collector Installations on Large Pulverized Coal Boilers. *By L W Cadwallader, Potomac Electric Power Co.*

In 1948 we decided to find some way to install mechanical collectors in series with precipitators. We replaced the duct work between precipitator outlet and induced draft fan inlet which put the mechanical collectors "after" the electrostatic precipitators.

The results have been gratifying. While we had previously taken advantage of darkness to cover most of the soot blowing and precipitator cleaning periods—this procedure is no secret to power plant operators or smoke inspectors—since the installation of the mechanical collectors, we have blown soot and cleaned precipitators on a regular schedule night and day. We can honestly report that since then we have not received a single complaint on stack emission.

The new Potomac River Station, designed and built after the close of World War II, has two 800,000 lb per hr capacity boilers placed in operation in 1949 and 1950. After design work was practically completed, we had to install mechanical collectors in series with the electrostatic precipitator, due to a severe reduction in stack height. This was caused by proximity of Washington National Airport. The only possible location was between the air heater outlet and the precipitator inlet, putting the mechanical collector "before" the electrostatic precipitator.

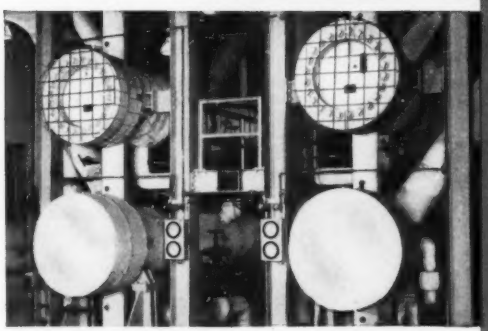
The series dust collector appears to be particularly well adapted to optimum efficiency of fly ash collection on large pulverized coal fired units. Efficiency of a mechanical collector increases with load, while efficiency of an electrostatic precipitator decreases with load. Combining these two types into a series unit results in a sustained high collection efficiency through a wide range of load, including maximum load which is a most important consideration. *APSPAA paper. No number.*

Directions for ordering papers on p 152

1 Evaporator Condensers
2 Closed Type Feedwater Heaters
3 Condensate Coolers
4 Jacket Water Coolers
5 Lubricating Oil Coolers
6 Evaporators
7 Oil Tank Suction Heaters
8 Fuel Oil Heaters
9 Blowdown Exchangers
10 Aircooled Heat Exchangers
11 Prefabricated Pipe
12 Propane Storage Tanks
13 Large Diameter Water Lines
14 Penstocks

check off your power plant needs

ALCO can meet them



For Example—Feedwater Heaters made by ALCO will meet your most exacting requirements because they have *all* these important features:

1. VIBRATIONLESS, TROUBLE-FREE OPERATION—support plates are of ¾ inch thickness or heavier, with tube holes drilled and reamed to a close fit and edges chamfered. Careful consideration is given to arrangement and spacing of tube supports to guard against vibration.

2. TUBE EROSION PREVENTED—alloy steel impingement baffles, one-quarter inch thick or heavier, are rigidly attached to the tube bundle support structure at points opposite the steam and drip connections to protect against tube erosion.

3. HEAT TRANSFER SURFACE EFFICIENTLY DESIGNED—tube bundles are designed to provide generous escape area and free-flowing distribution of the vapor throughout the shell space. Internal desuperheating and condensate subcooling furnished where required.

4. TIGHT JOINTS ASSURED—in all ALCO feedwater heaters, the tubes are roller-expanded into precision-drilled and reamed tube holes provided with parallel grooves. Full tongue and groove-gasketed joints are standard design.

5. CODES STRICTLY FOLLOWED—all ALCO feedwater heaters are designed and built to comply with the requirements of the ASME Code.

ALCO

ALCO PRODUCTS DIVISION
AMERICAN LOCOMOTIVE COMPANY
Dunkirk, N.Y.

***In step with tomorrow*—Alco Aircoolers, Heat Exchangers, Evaporators, Feedwater Heaters, Pressure Vessels, Pipe**

Mail the coupon for complete details about ALCO feedwater heaters and your other power plant equipment needs, or call your nearest ALCO Sales Engineer at Beaumont, Chicago, Dunkirk, Houston, Kansas City, Los Angeles, New York or Tulsa.

ALCO PRODUCTS DIVISION P
American Locomotive Company
Schenectady, New York

Gentlemen:
Please send me information on the following items:
1___ 2___ 3___ 4___ 5___ 6___ 7___ 8___ 9___ 10___ 11___
12___ 13___ 14___

Name_____ Position_____
Company_____
Address_____
City_____ Zone_____ State_____

with ABK METAL

pump life increase—5 to 1

. . . pipe life increase—3 to 1

Pumping 300 tons of ash per day at a large midwestern power plant, pump shells of alloy steel were averaging only six months life. Then pump shells were specified in ABK Metal—a nickel-chrome iron alloy of controlled structure with outstanding abrasion resistance. Installed in 1945, these pumps gave 31 months of service and handled 140,000 tons of ash...a pump life increase of over 500%.

In the same installation white iron pipe was formerly used in the ash pipe line...lasted no more than 2½ years. ABK pipe, installed in 1945, is still in service in many parts of the line...a pipe life increase of over 300%.

For economical handling of your wet or dry ash specify ABK Metal pump casings and impellers, pipes, elbows and fittings, liners, injector nozzles and similar equipment.

1263 AMERICAN Brake Shoe COMPANY

BRAKE SHOE AND CASTINGS DIVISION
230 Park Avenue, New York 17, N. Y.

More POWER NEWS

Begins on page 148

Complete Million-Ton Coal Storage Yard

Philadelphia Electric Co recently completed a million-ton coal storage yard that will serve as an emergency source of fuel for five P.E. generating stations on the Delaware and Schuylkill Rivers. The storage area, costing $2,500,000, covers 25 river-front acres in Philadelphia.

Coal is brought to the yard by river barge and stock-piled with self-propelled earth-movers designed for construction work. These machines can carry eleven tons of coal up a 10% grade.

When coal is taken from the stockpile, it is carried from the storage area to a hopper by the same equipment that stored it. Then it is carried by inclined belt conveyor to an elevated bin in the coal tower, dropped by boom conveyor or chute to barges, rail cars, or trucks for transportation to the generating station. The system can move 800 tons an hour. Four barges can be loaded and moored at the wharf.

To prepare the site for the new storage yard, the company had to construct a 1600 ft concrete sea wall, extend double railroad tracks 1200 ft along the wharf, and dredge 50,000 cu yds of material from the river bottom for fill. They also had to move an additional 150,000 cu yds of slag and fly ash to fill the area behind the bulkhead.

Chute du Diable Hydroelectric Plant Goes Into Operation

On the Peribonka River near Lake St. John in Quebec, the Chute du Diable plant has gone into operation and by the end of the year five 53,500-kva generators will be in service. Each unit is driven by a 56,500-hp vertical-shaft francis turbine operating under 106-ft head. This power will be delivered to a new 50,000-ton aluminum smelter built by the Aluminum Co of Canada, near Isle Maligne.

A second plant, known as Chute a la Savane, about 14 miles down the river from Chute du Diable, will go into service late this year or early next. The two plants are the same size and operate under similar conditions. They have a total capacity of 565,000 hp and represent one of the largest blocks of power to come into operation in Canada since the war. These plants will support the new smelting facilities and provide additional power supply to Alcan's other Quebec smelters, which this year produced 500,000 tons of aluminum.

Aluminum Co of America will construct a $400-million aluminum smelting project in Alaska as soon as the necessary land can be purchased and government approvals obtained. Leon E Hickman, vice-president and general counsel for Alcoa, said the project would initially be capable of producing 200,000 tons of aluminum annually. The project would be situated in the Taiya Valley district, near Skagway, Alaska.

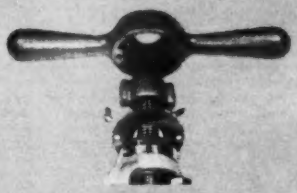
(*More Power News on page 216*)

TO AVOID THIS

(WASTING MANPOWER TO OPERATE HARD-TO-CLOSE HIGH PRESSURE VALVES, ESPECIALLY IN AN EMERGENCY)

SPECIFY EDWARD VALVES WITH IMPACTOR HANDWHEELS

One man using an Edward Impactor handwheel can equal the closing force of three strong men on an ordinary handwheel. Saves space, can be operated in cramped quarters, uses no toggle or gears, needs no cinch bars. Standard on many valves, optional on others. Edward catalogs detail its design. Write for literature.



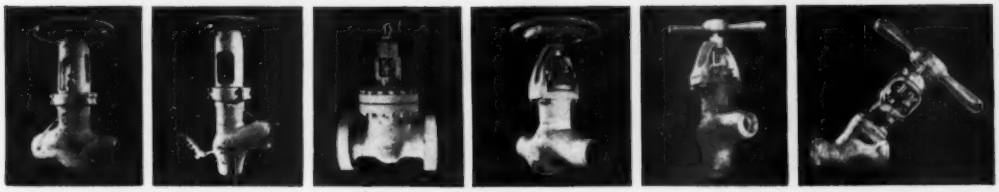
Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

1492 WEST 145th STREET, EAST CHICAGO, INDIANA

EAST CHICAGO, INDIANA

Another Product



you can lose plenty if you're

UNDER-TRAPPED

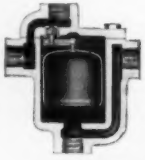
It doesn't pay to skimp on traps . . . especially steam traps. Water and air in steam lines reduces effective temperatures, wastes fuel and adds to maintenance costs.

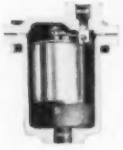
Clark Steam Traps have proven their outstanding drainage efficiency over many years of use in thousands of plants. Now, with the new Duo-Step double-drainage capacity feature, they can handle twice the condensate of ordinary traps.

It will pay you to see your Clark representative or write us for further information.

QUICK CLEANING STRAINERS. Remove dirt, scale and grit from steam, fluid and gas lines. Sizes ½" to 3" I.P.S.

SERIES "60" INVERTED BUCKET TRAP. Choice of horizontal or vertical inlet or outlet. For pressures up to 150 P.S.I. "Clark-loy" guided disc and seat.





CLARK "701" - D (DUO-STEP) TRAP. A forged steel trap for pressures up to 500 P.S.I. and temperatures of 750°F. Equipped with "double-drainage" Duo-Step leverage and venting, Clark-loy seats and discs. Pipe sizes ½" or ¾".

SERIES "80"-D (DUO-STEP) TRAPS. Cast semi-steel construction for pressures up to 250 P.S.I. and temperatures to 450°F. Equipped with Duo-Step Leverage and Venting, Clark-loy seats and discs. Pipe sizes from ½" to 2".

THE CLARK MANUFACTURING CO.

1830 EAST 38th STREET • CLEVELAND 14, OHIO

Clark

THE HOME OF DUO STEP LEVERAGE

The complete line of dependable fluid controls

BOOKSHELF

Controllers for Electric Motors. *(2nd Edition—1952). By Henry Duvall James, Consulting Engineer, Pittsburgh, Pa., and Lewis Edwin Markle, Design Engineer, Westinghouse Electric Corp. 426 pp, 6 x 9, 398 illust, cloth. $7. McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y.*

Modern electric-motor control is a far cry from the simple resistance starter first used. Today, practically every electric device is found in these controllers. Among them are motors, generators, rotary converters, frequency changers, transformers, mercury-arc rectifiers, disk rectifiers, saturable reactors, electron tubes, selsyns, contactors, and relays. These and many other ways of controlling dc and ac motors are covered in this second edition.

Material will give design engineers, electricians, equipment users and technical students a good general idea of design, application, operation and maintenance. Book begins with elementary problems like functions and types of control, how to read and make control diagrams, carries through to the latest types of control including supervisory using carrier current.

Best methods of motor acceleration and speed control, along with mechanical, dynamic and regenerative braking are given. Five different systems for controlling ac motors are explained, including saturable-core reactors. There is also new material on magnetic amplifiers, magnetic clutches, eddy-current brakes, cranes and dc motor control.

Industrial Waste Treatment. *(First edition, 1952.) By E B Besselievre, Chief Sanitary Engr, International Sales, Dorr Co, 391 pp, 6¼ x 9½ in., $7. McGraw-Hill Book Co, 330 W 42nd St, New York 36, N.Y.*

More and more the power engineer finds himself responsible for running the waste treatment system in his plant. So a practical book like this is certain to be a big help to power engineers whose knowledge of waste treatment is not too complete.

Starting with how and why industrial wastes become pollution problems, the author details the steps necessary for solution. Numerous tables and diagrams cover a wide variety of waste characteristics and best treatment methods. Specific types of equipment used in modern plants are fully discussed.

Also included are state and Federal laws concerning treatment of industrial wastes, methods of reusing and recovering waste materials and the handling of industrial wastes in municipal systems. Every power engineer who may or does run into industrial waste problems should have this book in his library.

Standards of Hydraulic Institute. *(Ninth edition, 1951.) 8¾ x 11¼, paper, 219 pp, many illust and tables, $3. Hydraulic Institute, 122 E 42 St, New York 17, N.Y.*

The new Standards have six sections—

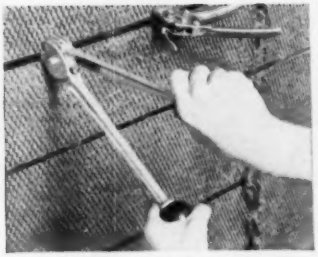
Save

TIME...POWER...MONEY

with EAGLE-PICHER Insulations

SUPERTEMP BLOCKS

These are efficient insulating blocks manufactured from Eagle-Picher High Temperature Mineral Wool. They derive low thermal conductivity, high refractory value, and outstanding chemical and physical stability from this basic insulating material. Weight is approx. 22 to 24 lbs. per cu. ft. Designed for temperatures up to 1700 F.

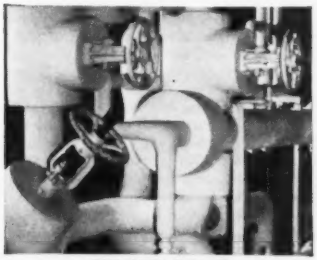


MINERAL WOOL BLANKETS

The answer to the problem of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Factory-made, these blankets are *certified* to meet rigid high standard specifications, offer unexcelled uniformity of mineral wool distribution. Withstand continuous exposure to temperatures as high as 1200 F. . . . offer maximum water repellence . . . resistance to steam, corrosive fumes, normal vibration.

SUPER "66" INSULATING CEMENT

A rust-inhibitive, super-adhesive insulating cement . . . offers exceptional coverage, extreme thermal efficiency. "Springy ball" structure—with small resilient pellets, each containing thousands of "dead" air cells—provides one of the most effective heat barriers known. Easily trowelled over all kinds of surfaces. Efficient up to 1800 F. . . . reclaimable where temperatures don't exceed 1200 F. Can be applied to any heated equipment.



ONE-COTE CEMENT

One-Cote provides both insulation and a smooth off-white finish coat. Unexcelled for coverage —100 lbs. covers approx. 40 sq. ft. one inch thick—Eagle-Picher One-Cote Cement is of uniformly high quality . . . quick setting, easy to handle . . . can be painted. This self-protected insulation withstands temperatures up to 1000 F.

MAXIMUM FUEL SAVINGS AND EXACT TEMPERATURE CONTROL WITH THESE EAGLE-PICHER INSULATIONS:

• Insulating Felts • Supertemp Block • Blankets • Loose Wool • Pipe Covering
• Stalastic • Stamastic • Insulseal • Finishing Cements • Insulating Cements
• Fireproofing Cement • Swetchek • Diatomaceous Earth Block.

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY *Since 1843*

GENERAL OFFICES: CINCINNATI (1), OHIO

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.

ROTOJET Junior TUBE CLEANERS

Powerful, Light-weight for SMALL TUBES

Rotojet Junior Tube Cleaners are powerful, yet light in weight. They are fed easily through the tubes with the operating hose, and can be shifted quickly from tube to tube. Simple design and precision construction assure long service, efficient use of power, and freedom from trouble. Clean tubes from .495" to 2.062" I.D.

Bulletin J-410 shows Rotojet Junior motors and accessories to help you do a faster, more thorough tube cleaning job. Send for your copy.

S32 ROTOJET Junior Air-driven Motor, cone cutter, universal joint.

C439 ROTOJET Junior Air-driven Motor, universal joint, drill head

C324 ROTOJET Junior Water-driven Motor, univ. joint, pivot head.

C434 ROTOJET Junior Air-driven Motor, flexible coupling, expanding brush.

ELLIOTT COMPANY-ROTO DIVISION

153 Sussex Avenue Newark 1, N. J.

More BOOKSHELF

Begins on page 210

general, data, sections on three classes of industrial pumps, and a section containing tentative standards on pipe friction. Centrifugal, rotary and reciprocating pumps are comprehensively covered from many different angles. These include construction materials, definitions, installation, operation and tests.

Anyone interested in good engineering practices for pumps should have a copy of these Standards. They are authoritative and represent best procedures in buying and using pumps.

Fundamental Jobs in Electricity. *2nd Edition. By E C Perry, supt of schools, Indiana, Pa., and H V Schafebook, electrical instructor, J B Stetson Jr High School, Philadelphia, Pa. 306 pp, 9½ x 6¾, $3.60. McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N. Y.*

This book was designed to provide the basic instructional material for introductory courses in electrical fundamentals. It is well suited for vocational training. The authors' step-by-step approach reduces amount of guidance required of instructor. Some of the new projects introduced in this edition include electronics, television, special lighting.

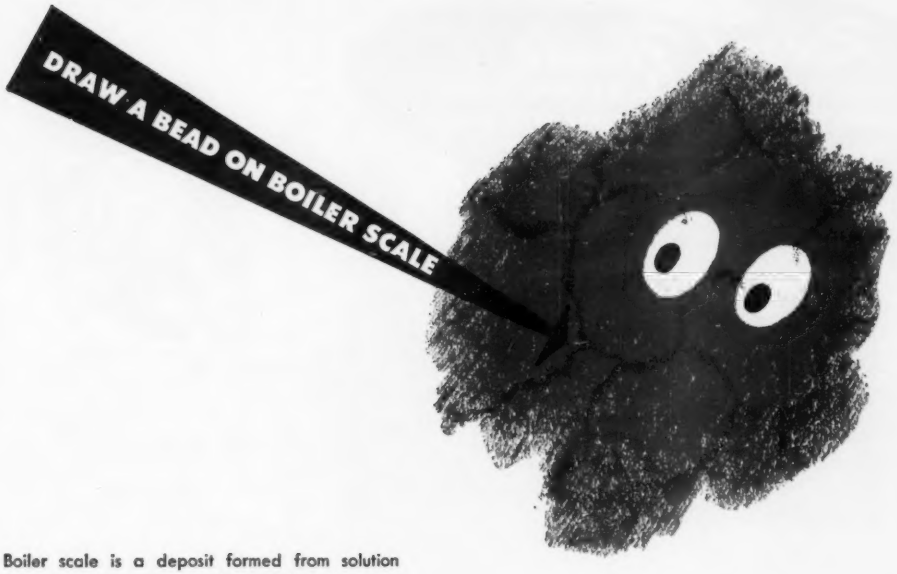
Book covers principles that can be absorbed by the student in his first two years of training. Typical first year would include fundamentals, signal wiring and communication. Second year would cover safety, light and power wiring, generators, motors, transformers, refrigeration, automobile wiring.

Each job or project has been planned to follow a definite order: assignment, circuit diagrams needed, application, explanation of operation, materials needed, tools required, layout, and questions.

Physical-Chemical Properties of Methane-Nitrogen Mixtures. *(1952.) By O T Bloomer and J D Parent, Technical Research Committee, Natural Gas Dept, American Gas Assn. 36 pp, 8½x11 in., illust, tables, $3.50. Institute of Gas Technology, Technology Center, Chicago 16, Ill.*

The rapid use of natural gas reserves to satisfy the ever-growing demand forecasts the need for using supplies of increasingly higher nitrogen content. There are proposals to remove part or all of the nitrogen prior to transmission, as a means of lowering pumping costs by increasing the effective pipeline thermal carrying capacity. Of added interest is the storage of natural gas as liquid. This requires separation of nitrogen in the liquefaction process to increase the effective capacity of storage systems and to avoid fractionation and consequent change of composition and heating value upon gasification.

Reliable, adequate vapor-liquid phase data on the methane-nitrogen system, necessary for engineering design of nitrogen-removal equipment, is presented here for the first time. The studies reported in the bulletin were initiated in 1947 under the Institute's basic research program.



Boiler scale is a deposit formed from solution directly in place upon a confining surface. It is crystalline and dense and usually retains its physical shape when removed. (Ref. ASTM D 887, D 933).

Use DREW POWER CHEMICALS

No boiler is exempt from scale under present day operating conditions. Scale results in tube failure, plant shut-down, trouble and inconvenience. It's the duty of every good water treatment company to recognize and solve this problem.

Draw a bead on boiler scale! Call in the Drew Engineer. The water samples and operating data that he obtains in your plant will be thoroughly analyzed in the Drew Laboratories, and you'll be given specific recommendations for corrective or preventive treatment. And you'll receive frequent and continous service, too.

Thorough investigation, proper treatment and frequent service have made Drew one of America's fastest growing water treatment companies. Consult the nearest Drew engineer or write for information.

Power Chemicals Division

E. F. DREW & CO., INC.

15 East 26th Street, New York 10, N. Y.

SAN FRANCISCO CHICAGO PHILADELPHIA BOSTON DALLAS

Nationwide Service in Boiler Water and Cooling Water Conditioning

DREW PRODUCTS

Record Floods....

LEAVE RIC-WIL STEAM LINES COMPLETELY DRY—OPERATING EFFICIENTLY!

Industrial area of Sioux City, Iowa, under four feet of water. Dotted line indicates route of Ric-wil 4" H.P. steam main.

The recent spring floods along the Missouri Valley areas presented excellent opportunity to test the water-tightness of Ric-wil Insulated Piping Systems. Inundated by flood waters at several central heating installations in this area, Ric-wil HEL-COR Conduit Systems remained entirely dry, with no damage to pipe and insulation — no loss in thermal efficiency!

At Sioux City, Iowa--

Mr. E. Rochester, Supt. of Steam Heating for the Iowa Public Service Co., advises: "After the flood subsided, we turned this 4" line back on and have no trouble with it. Steam mains (other than Ric-wil) from Kirk station were completely submerged in water. Had it not been for the installation last year of a Ric-wil 12" H.P. line, the entire downtown area would have been out of steam for several days."

At Marshall, Minn.--

Mr. M. C. Bright, Supt. of Utilities, reports: "Both this year and last year manholes were flooded. Last year the water covered parts of town served by the steam system for several days. Upon pumping and cleaning the manholes, no apparent damage had occurred to the Ric-wil installation. We are satisfied with the ability of the Ric-wil construction to resist manhole flooding without damage."

To provide this dependable, trouble-free operation for your steam distribution system, insist on Ric-wil — highly efficient, permanent, prefabricated for quick, easy installation.

Write for latest catalog — or contact us for engineering assistance when your steam mains are in the design stage.

THE RIC-WIL COMPANY

CLEVELAND • OHIO

AGENTS IN PRINCIPAL CITIES

LEADERS IN INSULATED PIPING PROTECTION

My Biggest Boner

► OUR PLANT TOOK OVER manufacture of a flammable product, so the insurance company banned smoking in one area. But the boys who smoked soon found a handy second-floor fire escape to serve them in their time of need.

One evening, an oiler feeling the urge grabbed his tobacco and nonchalantly jumped out on the landing. To his surprise he picked the wrong window and found himself being Newtonized toward the ground ten feet below.

Luckily he escaped with only a pair of "singing feet." But ever since then I've always managed to find a time and place for a smoking period for my crew. Allowing men to smoke on an exposed fire escape was just as much a boner on my part as the oiler picking the wrong window to jump through.

J P DEMAS, SR.
Roselle Park, N. J.

● What is your "biggest boner"? We'll pay ten dollars for each one we publish.

A new technique of hot radiography, known as the McElroy-McNutt process, permits inspection of weld roots and partially completed welds while the metal temperature is as high as 1200 F. This method eliminates the post-heating and cooling (to about 100 F) necessary for ordinary radiographic inspection, thus saving many man-hours. It can be used on large pipes, valves, and similar units. Further information from **Sam Tour & Co, Inc,** 44 Trinity Place New York 6, N.Y., who hold exclusive licensing rights on the process.

What's the $ Connection?

If there's a furnace operation in your setup . . . there's a mighty big connection between the CITIES SERVICE HEAT PROVER and your profit and loss picture.

Heat Prover—not an instrument you buy, but a service we supply—helps to increase furnace productivity through these five unique advantages:

1. **Rapid, continuous sampling.**
2. **Simultaneous reading of oxygen and combustibles.**
3. **Direct measurement of oxygen and combustibles.**
4. **Easy portability.**
5. **No maintenance; no re-calibration.**

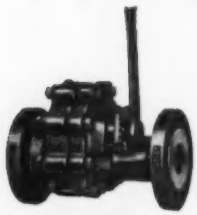
ACCURATE, FAST CITIES SERVICE HEAT PROVER ANALYSIS CAN PUT THE FINGER ON WASTE IN YOUR FURNACE OPERATION. It's being widely used in a great variety of industries. Find out how Heat Prover can serve you. Write Cities Service Oil Company, Dept. J-22, Sixty Wall Tower, New York City 5.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

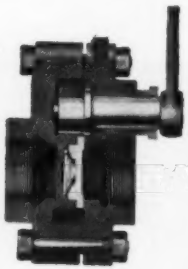
EVERLASTING VALVES

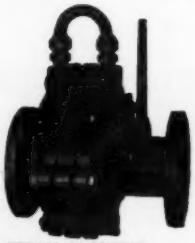
mean "Everlasting" Protection on these duties



GENERAL SERVICE

Wherever frequent use and quick operation is required for any liquid or gas at pressures up to 300 psi. These valves have outside stuffing box and gland.





STEAM JACKETED

Assure continued free flow of any material which congeals at ordinary temperatures.

FIRE PROTECTION

Closing type for inflammable liquid emergency shut-off, or opening type for deluge or drainage, assuring immediate and positive action with weighted pendulum stop.

BOILER BLOW-OFF

Quick-opening, also hand wheel operated, Angle and "Y" types meeting ASME Code requirements for pressures up to 600 psi.

BOILER WATER COLUMN

With indicator and locking device. Meets ASME Code requirements.

EVERLASTING FEATURES

For more than 40 years, EVERLASTING VALVES have been known for their ingenious design, simple sturdy construction, and long trouble-free life with low maintenance expense. Some of their distinctive features are:

Quick Action . . . opened or closed with less than a quarter turn of the operating lever.

Straight-Through Flow . . . the disc cannot become loose and accidentally check the flow.

Drop-Tight Seal . . . constant contact of disc and seat at all times prevents dirt or scale from getting between.

Self Regrinding . . . the disc rotates on the seat with each operation, thus regrinding the sealing surfaces.

No Wedge Action . . . all parts move between parallel faces.

Write for bulletin describing EVERLASTING VALVES in detail.

EVERLASTING VALVE COMPANY, 49 Fisk Street, Jersey City 5, N. J.

Everlasting Valves

TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF. EV-952

FOR EVERLASTING PROTECTION

More POWER NEWS

Begins on page 148

Coming Events

Oct 13-16—Engineering Conference, Technical Assn, Pulp and Paper Industry, Morrison Hotel, Chicago, Ill. R G MacDonald, secy, TAPPI, 122 E 42nd St, New York 17, N. Y.

Oct 19-24—Annual Meeting American Welding Society, Bellevue-Stratford Hotel, Philadelphia, Pa. J G Magrath, secy, AWS, 33 W 39th St, New York 18, N. Y.

Oct 27-30—American Gas Assn Annual Convention Atlantic City, N. J. AGA, 420 Lexington Ave. New York 17, N. Y.

Oct 30-31—Fifteenth Joint Meeting, ASME Fuels Div, American Institute of Mining Engrs, Philadelphia, Pa. O B Schier, meeting chairman, ASME, 29 W 39th St, New York 18, N. Y.

Oct 30-31—Pa. Electric Assn, Prime Movers Committee, Hotel Roosevelt, Pittsburgh, Pa. Chairman, E Gordon, Potomac Edison Co, Hagerstown, Md.

Nov 30-Dec 3—American Society of Refrigerating Engrs, annual meeting, Hotel Commodore, N. Y. ASRE, 40 W 40th St, New York, N. Y.

Nov 30-Dec 5—Annual Meeting ASME, Statler Hotel and Hotel McAlpin, N. Y. O B Schier, meeting chairman ASME, 29 W 39th St, New York 18, N. Y.

AEC's Ohio Plant Draws on Private Power

The new gaseous diffusion plant planned by the Atomic Energy Commission for the Portsmouth, Ohio, area, costing about $1,200,000,000, will not generate its own power. Instead the AEC will rely on existing power facilities for early operating needs (around 400,000 kw) and on new power plants to be built by a 15-company Ohio Valley Power Corp for the final 1,800,000-kw power load.

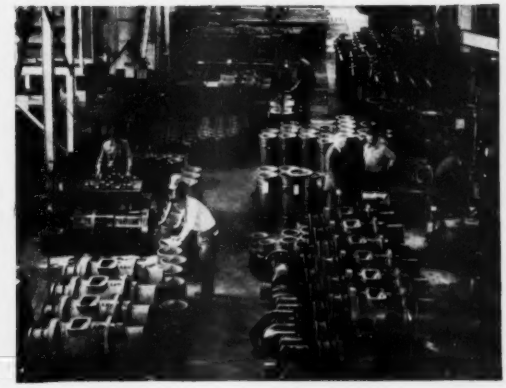
Availability of ready power plus the existence of suitable sites for later new power plants played a large part in selecting the Pike County, Ohio area. That, along with large quantities of suitable water, made the selection ideal from the AEC standpoint.

There are no appreciable radiation hazards, so this factor has no bearing on plant location. The gaseous diffusion process for producing uranium 235 separates the fissionable 235 from the non-fissionable 238 by mechanical means. The uranium, in a gaseous form (as a hexa-fluoride), is pumped through numerous extremely fine barriers with millions of holes per sq. in. The lighter U-235 atoms move faster and pass through the screens with greater frequency than the heavier 238 atoms. Gradually the 238's fall behind and separate out.

Technical Advances In Synthetic Liquid Fuel

Seven years of co-operative research by the Bureau of Mines and private industry have transformed oil shale from a material

Wear Control



VAN DER HORST
TRADE MARK

Here's a proven way to bracket your Diesel cylinder wear costs and clamp them down to a minimum. The same can be done for compressors.

Just send your worn liners and cylinders to Van der Horst. If they've already been oversized to the limit, that doesn't matter. We can plate them all back to original bore dimensions with VANDERLOY M.

This pure electrolytic iron bonds atomically and can be developed a quarter of an inch thick, if that's essential.

Over the VANDERLOY M we plate PORUS-KROME*. It makes cylinders last as much as four times longer than they did when new and unprocessed.

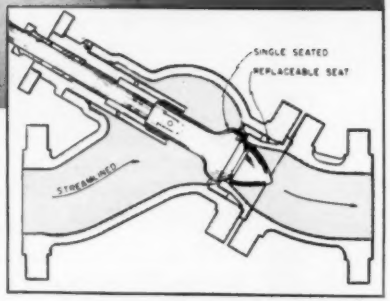
Then, back they go, ready to give you efficient and dependable service, until at long last they need another Van der Horst processing.

Since the cost for all this is surprisingly less than the price for new, unprocessed replacements, we think you'll want to know more about our wear control method. Why not drop us a line? W52-10

* *PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

U. S. PATENTS
2,048,578, 2,314,604 and 2,412,698

VAN DER HORST CORPORATION • OLEAN, N. Y.



The *New CONO-ESS* valve, with its streamlined body contours and single-seated construction, marks a big advance in reducing-valve body design and obsoletes the conventional double-ported, globe pattern control valves. CONO-ESS valve may be actuated by either the revolutionary air-powered gear-drive ROTOMOTOR or the unique air-powered CONO-CYLINDER. You get years of trouble-free service without the headaches usually associated with conventional steam reducing valves.

Available in sizes 1½" to 8", for pressures up to 1500 psi at 1000° F. Rotomotor-operated valves have declutching handwheel for manual operation in case of power failure, eliminating need for expensive bypass. Single-seated construction assures drop tight shut-off when closed.

BULLETIN C-1 gives information on various applications and details of operation. Write for it today.

CONOFLOW CORPORATION
2100 ARCH ST., PHILADELPHIA 3, PA.

CC-118

Cono-Controls

More POWER NEWS

Begins on page 148

that offered little hope of producing synthetic liquid fuels in 1944 to a very promising one.

Oscar L. Chapman, Secretary of the Interior, reiterated earlier recommendations that private industry, with such government assistance as may be available, proceed to construct pioneer commercial plants to produce synthetic liquid fuels from both oil shale and coal.

A few of last year's major accomplishments under the Synthetic Liquid Fuels Act of 1944 included: putting into operation a demonstration-plant for producing liquid fuels from coal synthesis gas; completing cost studies for commercial plants to produce liquid fuels from both coal and oil shale; gasifying powdered coal with oxygen under pressure on a pilot-plant scale; and starting construction of a 300-ton-per-day oil-shale retorting plant.

The report is issued in two volumes, one dealing with coal, Investigations Report No. 4865, the other with oil shale, No. 4866. They describe in detail last year's scientific and technologic work on producing synthetic liquid fuels from both of these raw materials. In addition, they review some of the accomplishments during the past seven years in all phases of the oil-shale program, from developing extremely low-cost mining methods to producing satisfactory refined products. Reports can be obtained through Bureau of Mines, Publications Distribution Sec, 4800 Forbes St, Pittsburgh 13, Pa.

ASME Nominates Officers for 1953

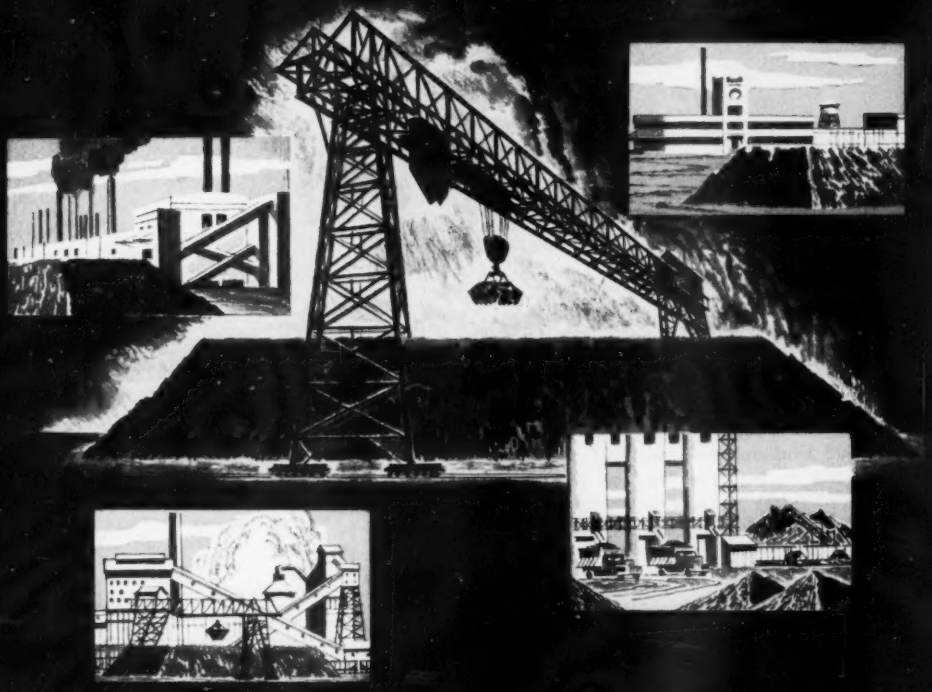
The American Society of Mechanical Engineers announces nomination of Frederick S Blackall Jr, president and treasurer of the Taft-Pierce Mfg. Co, as 1953 president. He heads a slate of nominees including four regional vice-presidents and two directors at large. Since only one name is presented for each office, nomination is tantamount to election.

Regional vice-presidents nominated are Henry R Kessler, manager Republic Flow Meters Co, New York, N.Y.; Paul R Yopp, district sales manager, the Babcock & Wilcox Co, Atlanta, Ga; Ben George Elliott, professor of mechanical engineering, University of Wisconsin, Madison, Wis.; Harry R Pearson, personnel director, Dallas Power and Light Co, Dallas, Tex.

Nominated as directors-at-large are David W R Morgan, vice-president, Westinghouse Electric Corp; Ralph L Goetzenberger, vice-president, Minneapolis-Honeywell Regulator Co.

Metropolitan Water District of Southern California has ordered four 12,500-hp pump motors from **Westinghouse Electric Corp.** The motors are for units four and five at the Eagle Mountain and Hayfield pumping stations of the Colorado River Aqueduct System. They are rated at 6900 v, three phase, 60 cycles, and scheduled for delivery in late 1953.

tomorrow's fuel supply



BEACON COAL

EASTERN GAS AND FUEL ASSOCIATES

PITTSBURGH • BOSTON • CHICAGO • CLEVELAND • DETROIT
NEW YORK • NORFOLK • PHILADELPHIA • SYRACUSE

For New England:
New England Coal & Coke Co.

For Export:
Castner, Curran & Bullitt, Inc.

EASTERN GAS AND FUEL ASSOCIATES

GREEN FANS . . . Used by Many Leading Utilities

One significant fact about Green Fan Installations at the New Orleans Public Service Plant is that two different boiler manufacturers were involved . . . two different types of boilers but Green Draft Fans for all three boilers. Each boiler has two Green Induced Draft Fans and one Green Forced Draft Fan.

When a concern has specialized on an important piece of power plant equipment for many years, that firm is rightly called the "authority" on the subject. This is the position of Green Fuel Economizer Co. in the field of mechanical draft fans. The name Green is synonymous with Draft Fans highly acceptable to industry.

The Line of Green Induced and Forced Draft Fans includes many types in many sizes which are described in Bulletin No. 168. We shall be glad to discuss your fan requirements with your own engineers, with your consulting engineers and with the boiler manufacturer of your choice.

THE GREEN *Fuel Economizer* COMPANY INC.

BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

More FREE BULLETINS

Begins on page 163

COMPRESSORS AND ACCESSORIES

B16 RADIAL AIR COMPRESSORS — Two-stage air-cooled units, 80 to 125 psi discharge. 12-page bulletin H-630-B1 gives dimensions, weights for bare, base-mounted, close-coupled compressors. Capacities, sizes, specifications, photos. Worthington Corp, Harrison, N.J.

B17 PORTABLE COMPRESSORS — *Gyro-flo* units, rotary sliding-vane design, 600, 315, 210, and 105 cfm units described in bulletins 2310-B, 2316, 28B, and 2314. Gasoline or diesel-engine operated. Ingersoll-Rand Co, Dept PC, 11 Broadway, New York 4, N.Y.

B18 COMPRESSOR MAINTENANCE — Preventive Maintenance for Engines and Compressors, by Robert S Ridgway, and Operation and Maintenance of Vertical Gas-Engine-Driven Compressors by Jay B Williams and V E Ford, reprinted from *Petroleum Refiner* and *Petroleum Engineer*. 20-page booklet. Clark Bros Co, Inc, Olean, N.Y.

B19 MINIATURE COMPRESSORS — Model GXA delivers 640 cu in per min at 0 psi, model K, 1728 cu in per minute at 0 psi. 2 catalog sheets give specifications, photos, capacities. Cornelius Co, Box 905, Minneapolis, Minn.

ELECTRICAL AND MECHANICAL CONTROLS

B20 STEAM STATION INSTRUMENTS —42-page bulletin 90-2 discusses supervisory instruments for measuring temperature, pressure, flow, power generation, etc. Diagrams, photos. Minneapolis-Honeywell Regulator Co, Brown Instruments Div, Station 40, Wayne & Windrim Aves, Philadelphia 44, Pa.

B21 PROGRAM CONTROLLERS — Cam-operated units for controlled schedules of time-temperature, or other variables like weight, strain, etc. 8-page bulletin 1502 gives photos, advantages, specifications. Minneapolis-Honeywell Regulator Co, Brown Instruments Div, Station 213, Wayne & Windrim Aves, Philadelphia 44, Pa.

B22 DIAPHRAGM CONTROL VALVES —Photos, sectional drawings, face-to-face dimensions of new and redesigned units. 24-pages, section 105, *Climax* controls catalog. Black, Sivalls & Bryson, Inc, Adv and Sales Promotion Dept, 7500 E 12th St, Kansas City 3, Mo.

B23 PILOTS AND CONTROLLERS — Time cycle, pressure, manual remote controllers, vacuum and safety shut-off pilots. 18-pages, section 110, *Climax* controls catalog has photos, cross-section diagrams, parts lists, etc. Black, Sivalls & Bryson, Inc, Adv and Sales Promotion Dept, 7500 E 12th St, Kansas City 3, Mo.

B24 CENTRAL CONTROL PANELS — Bulletin outlines technique for designing electric control installations for heating and air conditioning systems. 8 pages, bulletin F 5265. Barber-Colman Co, Rockford, Ill.

B25 DIESEL ALARMS AND SHUT-DOWNS—For stationary engines. Floor and wall type controls have protective relays, signals, gages, etc, to safeguard operation. 4-page folder 4806-B. National Supply Co, Engine Div, Springfield, Ohio.

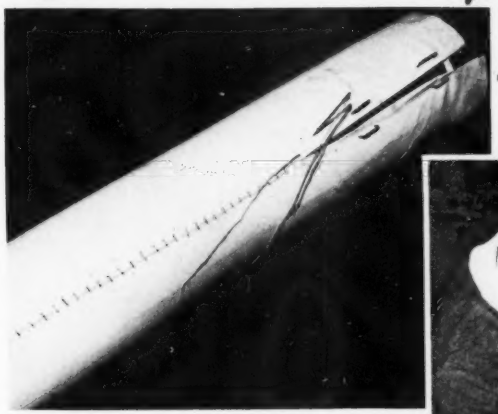
ELECTRICAL EQUIPMENT

B26 INDUCTION MOTORS—For flexible power needs, capacities 100 to 1500 hp. 8-page bulletin 1400-PRD-205 gives construction, installation photos. Electric Machinery Mfg Co, Minneapolis 13, Minn.

B27 WORM-GEAR MOTOR — Low speed, right-angle type GW units, speeds 20 to 155 rpm, ratios up to 58:1, ratings ¼ to 3 hp. 8-page bulletin shows construction, production. U. S. Electrical Motors, Inc, Box 2058, Los Angeles 54, Calif.

B28 INDUCTION MOTORS—Outdoor, splashproof units, 2 poles, 250-

Eliminate costly sewing of Lagging Cloths..



by specifying Foster LAGFAS as adhesive and surface coating.

Labor costs are reduced by as much as forty per-cent when fabric coverings are *cemented* over pipe insulation with Foster Lagfas (81-42W). Besides this astounding saving in application costs, a much more durable and attractive finish results.

Lagfas, the pioneer lagging adhesive—required in many military and major industrial specifications —is a true-white, free-flowing resin emulsion possessing remarkable adhesive and protective powers for canvas and other fabrics over thermal insulation. Lagfas is fire-retardant, and resists yellowing; it is *non-toxic* to workmen, and dependably uniform. Fabrics coated with Lagfas are easily washed without absorbing moisture, and readily painted without further sizing.

A TYPICAL SPECIFICATION

When insulation has been installed according to specification or following the practice approved by the manufacturer, all longitudinal and joint laps of canvas or asbestos cloth jacket shall be adhered with brush application of Lagfas (81-42W) as manufactured by Benjamin Foster Company, Philadelphia 31, Pa. Laps shall be drawn snugly over insulation to prevent wrinkles and holidays.

To make exterior fabric surface washable, water-resistant, and paintable, and to shrink canvas tighter onto insulation, a final coat of Lagfas shall be applied to entire surface.

BENJAMIN FOSTER COMPANY • PHILADELPHIA 31, PA.

Makers of LAGFAS • SEALFAS • FIRE-RETARDANT MASTICS • TRI-GUARD COATINGS • ADHESIVES, SEALERS, AND SURFACE COATINGS FOR INSULATION AND INDUSTRIAL USES

JUST WHAT THE ENGINEER ORDERED

For compact, efficient steam production

CHARGE TO: PITNEY BOWES INC.
SHIP TO: Stamford, Conn.
TYPE: B

CHARGE TO: PIONEER SOAP
SHIP TO: San Francisco, California
TYPE: B

CHARGE TO: J. D. JEWELL CO.
SHIP TO: Gainesville, Georgia
TYPE: B
STEAM RATING: 14,000 lbs. steam per hr.
DESIGN PRESSURE 160 lbs.

TYPE B DESIGN FEATURES

- Factory fabricated boilers require minimum field work.
- In many cases, sizes up to 330 HP can be shipped completely assembled.
- Water tubes along furnace side walls reduce maintenance costs.
- Furnace design provides high efficiency with any method of firing.
- Extremely low head room. Maximum capacity for floor area.
- Can be operated at high overloads without disturbing water level.

Write for free catalog on the Type B or on any of the units listed below.

BOILERS BY BIGELOW

Water Tube Boilers — Bent Tube Types
Horizontal Return Tubular Boilers
Scotch Type Boilers
Two-Pass Boilers
Electric Steam Generators

BI-11

THE BIGELOW COMPANY • NEW HAVEN 3, CONN.

BIGELOW REPRESENTATIVES: Boston • New York • Chicago Philadelphia • Syracuse • Detroit • Atlanta • Milwaukee New Orleans • Oklahoma City • Petersburg, Va. • Washington, D.C. San Francisco • Los Angeles • Seattle • Knoxville

More FREE BULLETINS

Begins on page 163

4000 hp; 4 to 14 poles, 50-3000 hp. 4-page bulletin PB-7000-3 gives construction features, diagrams, photos. Elliott Co, Ridgway Div, Ridgway, Pa.

★ **ALLSPEED MOTOR DRIVES** — Units 1/3 to 7½ hp, horizontal and upright types, closed or skeleton construction. 16-page book AS-1600-B6 gives dimensions, operation, maintenance, selection data, how to change belts. •Request direct on company letterhead, not from POWER. Worthington Corp, Harrison, N.J.

B29 WIRES AND CABLES—186-page general catalog on more than 500 different wires and cables. Construction, operation, photos, specifications, technical data. U. S. Rubber Co, Att R H Turner, Rockefeller Center, New York 20, N.Y.

★ **POTHEADS AND TERMINALS**—Design data, ordering and installation instructions for all types up to 46 KV. Indoor and outdoor types and popular designs for transformers and switchgear. Catalog section 079-13. •Request direct on company letterhead. Anaconda Wire & Cable Co, Att E F Luna, Sales Promotion Director, 25 Broadway, New York 4, N.Y.

INSULATION, HEAT, COLD AND VIBRATION

B32 HEAT INSULATION—85% magnesia, light density type pipe and block insulation for heat ranges up to 550 to 600 F. 12-page booklet gives properties, uses, characteristics. Tables, charts, photos. Mundet Cork Corp, 7101 Tonnelle Ave, North Bergen, N.J.

B33 CELLULAR GLASS INSULATION—*Foamglas* sandwich panel construction described and illustrated in 4-page bulletin 37-B. Pittsburgh Corning Corp, 307 Fourth Ave, Pittsburgh 22, Pa.

B34 CERAMIC COATINGS—To extend metal life at high temperatures. 24-page bulletin gives benefits, design features, properties of *Solaramic* coatings, uses in aircraft and industrial applications. Solar Aircraft Co, Research Products Div, San Diego 12, Calif.

B35 SILICONE RUBBER — Comprehensive information on properties, applications, classes and design specifications of silicone rubber. 24-page bulletin CDS-3 has photos, charts, test methods. General Electric Co, Chemical Div, Pittsfield, Mass.

MAINTENANCE MATERIALS

B36 ROD PACKING — Lattice-braid type has unified construction. Standard coil packages in sizes up to 1 in. 8-page bulletin has cross-section drawings, illustrates types, uses, specifications. Garlock Packing Co, Palmyra, N. Y.

B37 PHENOLIC RESIN COATINGS—Protect piping and equipment against corrosion. *Ricwilite* 1060, baked-on or heat-hardening type, and *Ricwilite* 7100, cold-setting type. Two 4-page bulletins give properties, applications, photos. Ric-Wil Plastic Coating & Mfg Corp, 1290 Euclid Ave, Cleveland 15, Ohio.

B38 TURBINE OIL RECLAIMER — Removes solids, acids, moisture, and air from lubricating oil. Continuous or intermittent operation. 4-page bulletin R-275 gives features, photos. Hilliard Corp, Elmira, N. Y.

B39 CORROSION PROTECTION—For steam and condensate return lines. 6-page bulletin describes *Corarol* organic amine process, gives case histories. Western Chemical Co, 713 Washington St, Kansas City 6, Mo.

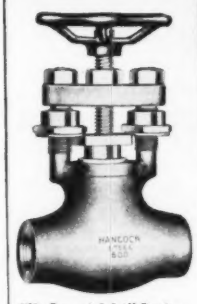
B40 SELF-LOCKING FASTENER — *Rollpin* is practical substitute for rivets, cotter pins, set screws, stop pins, hinge pins, shaft keys, etc. Fits holes drilled to production-line tolerances. 16-page bulletin 800. Elastic Stop Nut Corp, Sales Dept, 2330 Vauxhall Rd, Union, N. J.

(*Continued on page 224*)

They've got what you want!

600# HANCOCK STEEL WELDVALVES

1. **"300 Brinell" Stainless Steel Disc and Integral Stellite Seat** — accurately finished, perfectly aligned — end valve seat leakage and replacement. No wire drawing, galling, steam cutting, erosion or corrosion.
2. **Maximum Use of Super-Strong, Leak-Proof Welding** to keep maintenance costs low.
3. **Stainless Steel Ball Bearing Stem-to-Disc Connection** for longer wear, even distribution of load, easy operation.
4. **Corrosion-Resistant Back Seating** permits stuffing box shut-off around the stem with valve fully open.
5. **Extra-Strong Upper Structure** — far stronger than conventional designs.
6. **Yoke Post and Gland Nut Threads Protected** permanently — always workable. Yoke post is chrome impregnated.
7. **Compact Design** saves space, permits close alignment of piping with near structures.
8. **Safe, Comfortable Handwheel** — designed to operator specifications.
9. **Completely Interchangeable Parts** — saves time, trouble, money.
10. **Special Treatment** resists corrosion of valve exterior.



"No Bonnet Joint" Design

Bolted Bonnet Design

600# Hancock Steel Weldvalves are built for trouble-free dependability in the severest services. Despite their long-life performance, they cost no more than ordinary valves. You get more for your money when you invest in Hancock Steel Weldvalves.

Made in globe and angle types, 600# Hancock Weldvalves are available for *all* pressures up to 850 P.S.I. at 750°F.—O.W.G. 2000#, 100°F. No bonnet joint in sizes ¼" through 2" and bolted bonnet designs in sizes 1¼" through 2" — screwed, socket weld and flanged ends.

Your nearby Hancock Valve Distributor has all the design and operational data that make these valves outstanding in service life and economy. Phone him for prompt attention to your needs.

When Hancocks go in, valve costs go down

1877 HANCOCK U S A

HANCOCK VALVES

MANNING MAXWELL & MOORE TRADE MARK

A product of **MANNING, MAXWELL & MOORE, INC.** WATERTOWN 72, MASSACHUSETTS

MAKERS OF 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

Keep Temperatures Up

–Fuel Costs Down–with

Stickle Steam Traps!

For quick, sure drainage—at lowest cost—specify Stickle Steam Traps! Applied to your heating and processing equipment, Stickle Traps discharge air and non-condensable gases *right now*—save fuel, save steam, *save money!*

Durable, dependable Stickle Traps operate on the time-tested Open Float principle. Self-re-grinding valve and seat prevent wire-drawing. No levers, hinges, or pins to repair or replace. No thermal elements or diaphragms to rupture or crack from metal fatigue.

THE STICKLE "SERIES T"

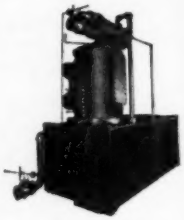
Stickle builds a wide variety of traps, for a wide variety of requirements. One of the most popular groups is the Stickle "Series T"—available in 12 different styles and sizes. "Series T" traps supply especially efficient drainage for equipment operatig on low and medium steam pressures. Satisfied users report Stickle "Series T" Traps have been in use for as many as 20 years *—without a penny for maintenance!*

Get all the facts—free. Wrtie for Illustrated Bulletin 415. For medium and high pressure service, write for Bulletins 115 and 315.

STICKLE STEAM SPECIALTIES COMPANY

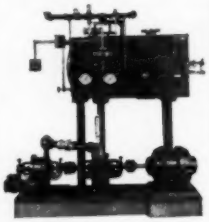
2265 Valley Avenue • Indianapolis, Indiana

other cost-cutting STICKLE equipment



Stickle Open Coil Feed Water Heaters

Stickle Regulating and Reducing Valves



Stickle Differential Drainage and Boiler Return System

FREE! Get all the money-saving details, complete with illustrations. Wriet for free Stickle Bulletins 117 (Heaters), 235 and 435 (Valves), and 250 (Return Systems). *Do it today!*

More FREE BULLETINS

Begins on page 163

B41 **ODORLESS ENAMEL**—Flat, semi-gloss and high gloss finishes, can be painted over damp walls or fresh plaster. 8-page brochure gives properties, color chart. Wilbur & Williams Co, 130 Lincoln St, Boston 35, Mass.

MATERIALS HANDLING

B42 **VIBRATORS**—Feeders, shakers, elevators, paper joggers, switches, drills, hammers, etc. 52-page catalog 525 gives photos, specifications of complete line. Syntron Co, Homer City, Pa.

B43 **ELEVATOR MACHINES**—Heavy-duty external - geared traction units for large freight elevators. Lift heavy loads at high speeds. Units have dc motors, helical-cut gears. 4-page bulletin B-779, Otis Elevator Co, 260 11th Ave, New York 1, N. Y.

B44 **FORK LIFT TRUCKS**—Diesel or gasoline engine powered. FT series, capacities from 3000 to 7500 lbs. 8-page bulletin 1570 gives specifications. Buda Co, Harvey, Ill.

B45 **CLEATED CONVEYOR** — For light-duty parts handling. 4-page bulletin LPV-52 gives specifications, uses. Rapids-Standard Co, Inc, Grand Rapids 2, Mich.

METALS AND ALLOYS

B46 **THERMOSTATIC BIMETAL** — Successful applications. 32-page bulletin presents 18 cases where products are automatically controlled by bimetal, gives condensed design and engineering data. W M Chace Co, 1663 Beard Ave, Detroit 9, Mich.

B47 **IRON CASTINGS GLOSSARY** — Explains over 150 terms in common use between suppliers and users of ferrous and non-ferrous castings. 36-page bulletin. International Nickel Co, Inc, Dept EZ, 67 Wall St, New York 5, N. Y.

B48 **X-RAY FLUORESCENCE ANALYSIS**—Non-destructive testing at shop level. 2-page reprint of article from *Steel* describes method of identifying elements. Research & Control Instruments Div, North American Philips Co, Inc, 750 S Fulton Ave, Mount Vernon, N. Y.

METERS AND INSTRUMENTS

B49 **METER RELAYS**—22-page booklet gives instructions, descriptions, circuit diagrams, components of contact meter relays. Assembly Products Inc, Chagrin Falls, Ohio.

B50 **HYDRAULIC POSITIONER**—Remote control unit for positioning and indicating applications for valves, throttles, rotation, clutches, pitch, level, flow, static pressure, etc. 12-page bulletin 157 gives specifications, principles, diagrams. Farris Hydrotorque Corp, 627 Commercial Ave, Palisades Park, N. J.

B51 **INDUSTRIAL PROCESS CONTROL**—38-page second quarter 1952 issue of *Instrumentation* gives articles on program control, time-proportioning control, graphic panels, etc. Minneapolis-Honeywell Regulator Co, Industrial Div, Station 213, Wayne & Windrim Aves, Philadelphia 44, Pa.

★ **MECHANICAL DEVELOPMENT APPARATUS** — Precision components for rapid and economical assembly of gear trains and actuator devices. 16-page bulletin MDA-200 gives parts listings, photos, descriptions. ★Request direct, on company letterhead. Servomechanisms, Inc, Post and Stewart Aves, Westbury, N. Y.

B52 **DIESEL ENGINE PYROMETER**—Portable unit for test purposes and field service. 2-page bulletin P1247 gives specifications, diagram. Bristol Co, Waterbury 20, Conn.

PIPING, VALVES, FITTINGS AND SPECIALTIES

B53 **CARBON STEEL TUBING**—Seamless or welded types, for pressure

Put 'em on a diet . . . with Pure Oil Industrial Lubricants

In the complete line of high-quality industrial lubricants Pure Oil makes, you will find many oils and greases designed to do several *different* jobs, instead of one specific job.

And to do each job *equally well.*

This makes it possible for you to do *all* your lubricating with *fewer* lubricants. In other words, you can

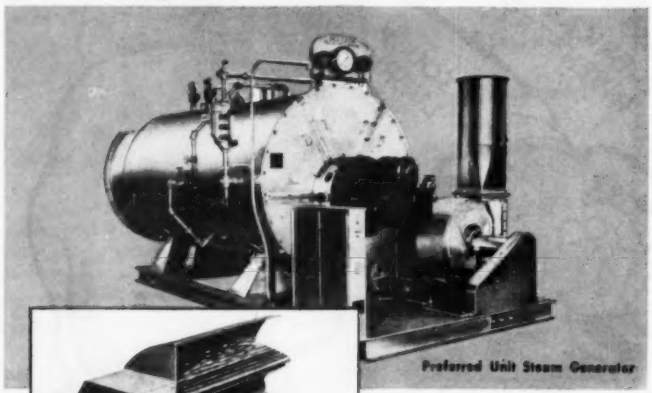
simplify and save . . . with Pure Oil Industrial Lubricants

If you would like to keep your lubrication requirements from hogging your profits (and a penny saved is more than ever a penny earned, these days!) write: The Pure Oil Company, Industrial Sales, 35 E. Wacker Drive, Chicago 1, Illinois.

Be sure with Pure

THE PURE OIL PURE COMPANY, U.S.A.

there *IS* a difference*



Preferred Unit Steam Generator

* Anti-Stress Deck . . . another 25 year built-in Preferred "Quality Feature" that means a lower yearly amortized investment.

PREFERRED *has NEVER lost a pressure vessel tube sheet!*

Again PREFERRED UNIT STEAM GENERATORS come through with another "quality feature" built-in to insure 25 years of dependable low-maintenance service at a minimum efficiency of 80%.

The anti-stress deck construction is an added design feature exclusive with Preferred generators. The rear upper section of the shell is cut away to expose the portion of the tube sheet above the water line. The refractory baffling is installed in such a way that the heat in the refractories is directed to the lower portion where the heat is quickly absorbed by the water. As a direct result of this "quality feature" the sections of the rear tube sheet — above and below the water line — remain in close balance. It is this balance that prevents unequal stress action within the sheet area. It is a recognized safety factor that is insurance for long life and low maintenance.

That's why we say . . . records prove there has never been a loss of a pressure vessel tube sheet on Preferred Unit Steam Generators.

For specific details on this Preferred "quality feature" write today for Bulletin 2000.

PREFERRED UTILITIES MFG. CORP.
1860 BROADWAY · NEW YORK 23, N.Y.

015

More FREE BULLETINS

Begins on page 163

uses. 4-page bulletin TDC-142 gives condensed data on properties, upsetting, swaging, flanging, welding, etc. Babcock & Wilcox Co, Tubular Products Div, Beaver Falls, Pa.

B54 **MULTI-PURPOSE HOSE** — For air, water, oil, greases, gasoline, oxygen, acetylene, propane, steam. Five basic types each specifically designed for its type of service color-coded for identification. 8-page bulletin. Thermoid Co, 400 Whitehead Rd, Trenton, N. J.

B55 **TUBE FITTINGS** — Aluminum *triple-lok* fittings in medium sizes for use with aluminum tubing. 4-page bulletin 4316B2 gives types, uses, lists distributors. Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio.

B56 **AIR VALVES**—Hand, foot, solenoid, cam and pilot types, for pressures up to 150 psi, sizes ⅜ to 1 in. 12-page catalog 303 gives descriptions, diagrams, specifications. Rivett Lathe & Grinder, Inc, Brighton 35, Boston, Mass.

B57 **GAGES** — Reflex, transparent, tubular, non-frosting, vacuum jacketed, high pressure, etc, types. Also valves, water columns, sight glasses. 4-page bulletin 180 gives general description of each type in complete line. Jerguson Gage & Valve Co, 80 Fellsway, Somerville 45, Mass.

PUMPS

B58 **BOILER FEED PUMPS** — Two, four, and six-stage, pressure ranges 350 to 1200 psi. Also horizontal duplex piston pumps in 250 to 400 psi. Bulletins 230, 241, 244, 246. Warren Steam Pump Co, Inc, Warren, Mass.

B59 **SUMP PUMP**—Submersible, cast-iron unit with waterproof case and *no-float* liquid control switch. 1-page bulletin 107 gives description, photo. Kenco, Inc, 1125 N Ridge Rd, Lorain, Ohio.

WATER TREATMENT

B60 **pH CONTROL**—Theory and practical applications described in 16-page bulletin 430-1. Instruments described include recorders, controllers, electrodes, amplifiers, accessories. Mounting dimensions, photos. Foxboro Co, Foxboro, Mass.

B61 **WATER FILTERS** — Pressure type units for removing suspended matter. Vertical and horizontal designs valve arrangements to meet requirements. 12-page bulletin WC-107 gives design, accessories, capacities, dimensions. Graver Water Conditioning Co, Dept 10-7, 216 W 14th St, New York 11, N. Y.

B62 **WATER TREATMENT** — *Electromatic* units eliminate scale from boilers and heat transfer equipment. 4-page bulletin gives description, installation. Electromatic Water Treatment, Inc, 475 Fifth Ave, New York 17, N. Y.

B63 **GLUCOSATES**—Organic methods of scale and corrosion control, now available in drums ready for use. 4-page bulletin lists types, uses. D W Haering & Co, Inc, Harlandale Station, San Antonio, Tex.

Possible contamination of water by atomic radiation is a problem deserving study by sanitary engineers, according to Roy J Morton, Health Physics Div, **Oak Ridge (Tenn.) National Laboratory.** Speaking before the centennial convention of the ASCE, he said that the sanitary engineer who may be faced with radiation contamination of water must not be over-awed by the novelty of the problem. In principle, he added, the sanitary engineering problems of nuclear energy operations are similar to other problems of sanitary control.

The Right Hand must know what the Left Hand is doing

Installing critical power piping, like handling puppets, requires smooth coordination for top-notch performance. The skill we've developed in more than a half century of service to the industry is your assurance of solid satisfaction. Let us give you an estimate on your next piping project.

W. K. MITCHELL & CO., INC.

2944 Ellsworth Street, PHILADELPHIA 46, PA.

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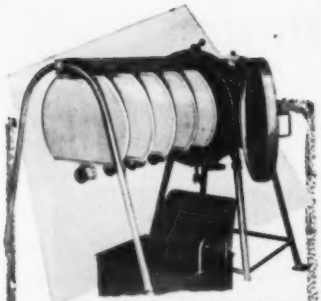
MITCHELL

PIPING SINCE 1899

WE ARE INDEPENDENT PIPING FABRICATORS AND ERECTORS



Close-up view of leaf-type filter used with Sorbo-Cel by Pullman-Standard

How Pullman-Standard operates boilers on a

1% blow-down basis...

with SORBO-CEL

At the Haskell & Barker plant of Pullman-Standard Car Mfg. Co., Sorbo-Cel solved the major filtration problem of removing oil from condensate returned to the two new 50,000 lb-per-hr 400 psi, 750-F boilers.

Pre-Coat Sorbo-Cel and regular Sorbo-Cel, specially processed high flow-rate diatomaceous silica powders, are used on leaf-type filters. After a film of Pre-Coat Sorbo-Cel has been built up on the filter screens, regular Sorbo-Cel is added continuously to the unfiltered water. This means a new filter surface is constantly presented to the oncoming water.

Results . . . Water filtered by Sorbo-Cel contained less than 0.1 ppm of oil . . . and boilers have since been operated on a *one per cent* blow-down basis.

Send coupon below for bulletin giving data on this low-cost way to remove oil from water. No cost or obligation.

Johns-Manville
SORBO-CEL

Johns-Manville
Box 60, New York 16, N. Y. POW-10

Please send me free bulletin giving advantages of Sorbo-Cel filtration.

Name_____

Company_____

Address_____

City_____ State_____

APPOINTMENTS

New Corporation Executives

Wm R Herod is elected vice-president of **General Electric Co,** and will continue as president of the International General Electric Co, which he has headed since 1945. IGE, a wholly owned affiliate since 1919 is now merged with and become a division of General Electric Co.

J D Swain and E H Mangan become executive vice-presidents of **Electro Metallurgical Co,** a division of Union Carbide and Carbon Corp.

At **Crane Packing Co,** A W Payne has retired as chairman of the board; he is succeeded by Frank E Payne. Karl V Rohlen succeeds to the presidency.

R B Steinmetz becomes vice-president in charge of manufacturing operations and L R Love vice-president in charge of sales at **Anaconda Wire & Cable Co.**

Arthur H Rahmann completes 50 years of service with **George Rahmann & Co,** manufacturers of machinery belting and industrial leathers. He has also been treasurer and director of the American Leather Belting Assn for the past 18 years.

New president of the Warner Gear Div of **Borg-Warner Corp** is E Swain Russey; he succeeds A P Emmert, who has retired from active management. **Walter Kidde Constructors, Inc,** appoint Taylor Milton vice-president. **Gustin-Bacon Mfg Co** announces that F H Ebbert is now vice-president and general sales manager.

New Operations Executives

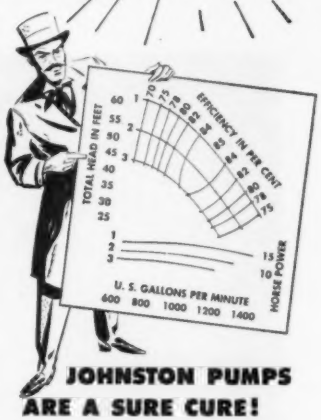
General Electric Co appoints W O Meckley manager of engineering and H M Wales manager of sales for the new accessory turbine organization; T N Ferren is superintendent of manufacturing, F W Dahlberg facilities engineer, J W Shirley production manager, and A C Eastman supervisor of inspection. John D Seaver is assistant manager of engineering in the industrial heating dept. Robert F Tinnerholm announces his retirement as general manager of the switchgear dept, after 40 years of service with the company. George R Prout transfers from the Hanford Works, Richland, Wash., to Schenectady, N.Y., where he will be vice-president of nucleonics and atomic projects.

Fairbanks, Morse & Co appoints R H Morse III general manager of the Beloit, Wis., Works, succeeding Orren S Leslie who becomes manager of manufacturing. Wm H Old has joined **Babcock & Wilcox Co** as director of purchasing, with offices in New York City. F E Peltier takes over as manager of central regional engineering and service for **Worthington Corp,** with offices in Cleveland.

J A McBride becomes general manager and vice-president in charge of sales of **Buell Engineering Co, Inc.** N A Brewer is named new general manager of **Allegheny Industrial Electrical Co,** succeeding Henry B Lee, III, who has resigned. At **American Brake Shoe Co,** Thomas W Russell Jr is appointed general purchasing agent.

Westinghouse Electric Corp names a new eastern district industrial manager—Kenneth L Horgan. He succeeds J S Parry Jr who recently transferred to E Pittsburgh

Suffering from
Horsepower Headaches?



JOHNSTON PUMPS ARE A SURE CURE!

Don't blow a fuse because you are overloaded with pumping troubles. The steep head-capacity and flat horsepower characteristics of Johnston Vertical Turbine Pumps prevent overloading of the motor regardless of fluctuations in capacity or head. Low starting torque requires less horsepower and results in higher efficiency and longer life of the motor.

The Treatment Is Painless

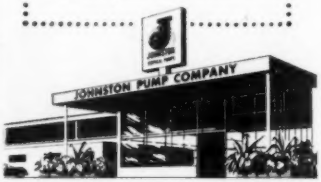
Every Johnston Pump is engineered for the specific duty for which it is intended. Trained hydraulic engineers are available at your nearest Johnston dealer or at the Johnston factory to furnish detailed information, proposals and anything else necessary to cure your particular pumping malady.

The Johnston Wonder Drug

Johnston Turbine Pumps are ideally suited for industrial and municipal applications because of their non-overloading characteristics, simplicity of construction, compactness, ease of installation, elimination of priming, low starting torque, capacity adjustment features and minimum maintenance costs.

Free diagnosis!

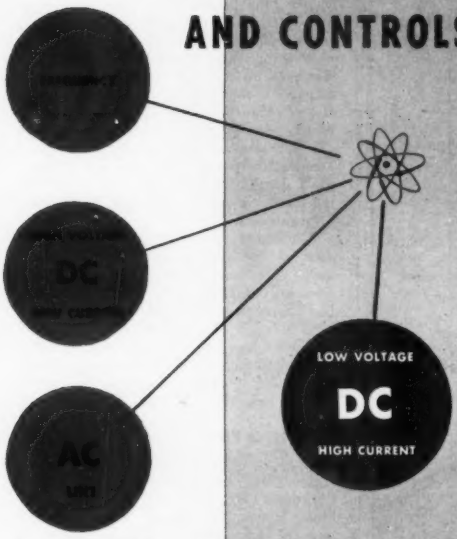
No matter what your pumping job, contact your nearby Johnston Dealer or write the factory direct for a free diagnosis of your pumping headaches.



JOHNSTON PUMP COMPANY
3272 EAST FOOTHILL BLVD., PASADENA 8, CALIF.
Headquarters for Vertical Turbine, Mixflow and Propeller Pumps Since 1909

SORENSEN

REGULATES AND CONTROLS



Nobatron Model E-6-5

The NOBATRON* maintains stabilized DC voltage under changing line and/or load conditions.

A complete line of catalog models are available, with output voltages of 6, 12, 28, 125, and 200 VDC, from 5 to 350 amperes.

Sorensen Nobatrons eliminate battery and generator troubles. They combine high regulation accuracy with maximum dependability and minimum maintenance.

All models are attractively finished. Most can be furnished either for relay rack mounting or in cabinets for bench-top use. Most units are metered; all are adequately protected against overload by suitable fuses and breakers.

COMMON NOBATRON SPECIFICATIONS

Input voltage range	95-130 VAC, single ϕ, 50-60 ~ High-current units 208/115, 3ϕ, 4-wire, wye.
Output voltage range	Adjustable ± 10% with rated accuracy, — 25% with lesser accuracy.
Regulation accuracy	± 0.2% from 1/10 to full load.
Ripple voltage	1% RMS. Time constant 0.2 seconds.

* Reg. U. S. Pat. Off. by Sorensen & Co., Inc.

WIDER OUTPUT VOLTAGE RANGE MODELS

Nobatron-RANGERS* are designed to meet the demand for power supplies similar to the Nobatron but with wider output voltage ranges.

Nobatron-RANGERS are continuously adjustable over extended output ranges, yet provide regulation accuracies of ±0.25% against line and/or load. Other specifications are identical to those of the standard Nobatrons.

Three models are available, the SR-30, SR100, SR-2. Capacities, respectively, are 3 - 30 VDC at 3 - 30 amperes, 3 - 135 VDC at 1 - 10 amperes, and 100 - 300 VDC at 1 - 10 amperes.

Investigate NOW the cost of a NOBATRON installation versus the overall cost of less satisfactory DC sources.

OTHER SORENSEN ISOTRONIC PRODUCTS INCLUDE:

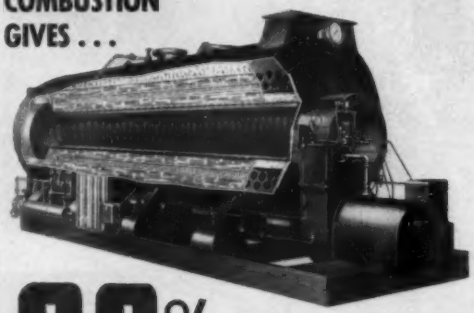
B-NOBATRONS (high-voltage, low-current DC Supplies)
FREQUENCY CHANGERS **VARIABLE AUTO TRANSFORMERS**
SATURABLE CORE REACTORS **AC LINE REGULATORS**

SPECIFY SORENSEN

For Complete Information Write

SORENSEN & COMPANY, INC.
375 Fairfield Avenue Stamford 1, Conn.

ONLY CYCLONIC COMBUSTION GIVES . . .



66% MORE POWER per sq. ft. of heating surface

By reducing heating surface requirements from 5 to just 3 sq. ft. per B.H.P., Cyclonic Combustion produces 66% more power per sq. ft.—saves up to ⅓ the space of conventional package steam generators. Cyclonic Combustion is the revolutionary new flame control used exclusively in Cyclotherm steam generators. Flame characteristics are controlled in a revolving spiral vortex traveling the full length of the furnace to insure maximum heat transfer without direct flame impingements or hot spots. The cyclonic action of the flame accounts for a 65 to 75% heat transfer within the main fire-tube. This high rate of heat transfer enables Cyclotherm 2 pass generators to maintain a guaranteed minimum efficiency of 80% for any steam requirement.

Cyclotherm steam generators with patented Cyclonic Combustion offer these additional features: Full power operation from a cold start in 15 to 20 minutes; Savings up to 50% on maintenance; Greater fuel savings; Boilers designed for oil or gas operation from 18 to 500 h.p., 15 to 200 psi operation pressure.

Proved superior in thousands of installations, Cyclotherm steam generators with new Cyclonic Combustion offer the most efficient and compact package steam generator on the market today. Find out more about Cyclotherm and Cyclonic Combustion—write today for a free illustrated folder.

The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of Underwriters Laboratories, Inc.

CYCLOTHERM STEAM GENERATORS

Cyclotherm Division U. S. Radiator Corp.
Dept. 24
Oswego, New York

Please send without obligation my copy of "All Your Questions Are Answered by Cyclotherm."

NAME .....
FIRM .....
ADDRESS .....
CITY ZONE STATE

More APPOINTMENTS

Begins on page 228

as assistant manager of the apparatus div. W E Benoit is now manager of the electronics div. John S Jacox becomes manager of purchasing for the aviation gas turbine div, Wilbur C Wilson purchasing agent for the S Philadelphia plant, and George A Fadler purchasing agent at Kansas City.

Marion Electrical Instrument Co names John D McLellan plant manager, and Herbert L Schachat manager of government sales. C L Hoshaw is manager of construction at **Philip Carey Mfg Co.** Raymond T Whitzel is made general manager of the smelting div of **Aluminum Co of America,** succeeding V C Doerschuk, who becomes technical consultant.

J M Selden takes over as manager of the Eastern division of **Shell Chemical Corp.** M R Fairlie is promoted to director of lubricants research for **Sinclair Research Laboratories, Inc.**

C A Patton succeeds O G Steele as manager of the **California-Oregon Power Co's** Yreka and Dunsmuir, Calif., divisions with headquarters in Yreka. Waverly D Packard has retired as superintendent of production, Springfield area, **Western Massachusetts Electric Co;** Peter C Vogler succeeds him as superintendent of steam production. Carl H Cummings becomes general manager at **Haydon Mfg Co.**

Engineering Personnel

Dr Soren H Mortensen, chief electrical engineer for the power dept of **Allis-Chalmers Mfg Co,** and his assistant, Fraser Jeffrey, have retired. Both men are pioneers in the electrical industry and are widely known through their numerous technical writings and appearances before engineering groups.

Four promotions at the Buffalo plant of **Worthington Corp** are as follows: Harold W Whiting, assistant to the executive engineer; W A Scheerer, chief engineer, compressor division; W J Blessing, consulting engineer; Wm M Kauffmann, chief engineer, engine division.

John H Porteus is appointed chief engineer of the **Luria Engineering Co.** Wm J Mullaney joins **Fischer and Associates** as contract engineer.

S C Leyland becomes manager of engineering for the meter division, **Westinghouse Electric Corp,** and Donald R Jenkins is manager of the gas turbine application engineering section at S Philadelphia. Rhule L Bell is Pacific coast industrial control engineer, with headquarters in San Francisco.

Sales Personnel

New district manager for **Union Iron Works,** with offices in New York City, is Lloyd J Westin. C L Peterson is new general sales manager, industrial division, **Minneapolis-Honeywell Regulator Co.** Assistant general sales manager of **Worthington Corp** is W A Finn.

John R Rowe joins the Dallas district office of **Electric Machinery Mfg Co** as assistant to the district manager. **New York Belting and Packing Co** appoints C A Franklin, Jr western district sales

A Program for 30 million new Americans

LISTEN to the voices of 30 million new Americans. They are answering the pessimists who say we are threatened with depression because we can't keep our farms and factories busy.

Let these pessimists read the future in the census returns. There is a tremendous upsurge in our population. Last year nearly 4 million babies were born. By 1960 we shall total 170 million people--30 million more than when war ended in 1945. This adds to our domestic market more people than there are in Canada and Australia combined.

Providing for these 30 million new Americans can keep our production machinery going at capacity. They call for new hospitals, schools and churches. Larger families need bigger houses to replace postwar houses that are too small now. More and bigger families need improved home equipment and more new automobiles. In short, to maintain and improve living standards for our children, we must work harder than ever before. To supply the needs of our 1960 population, including adequate national defense, it is estimated that the productivity of the individual worker must increase at least 30%, with additional investment of over 200 billion dollars in capital facilities.

There should be no room in this picture for depression. But we must have economy in government, elimination of waste and extravagance and a reduction of taxes and public debt. If we encourage private incentive, thrift and investment, we can bring about the greatest advance in health, wealth and happiness that America has ever known.

QUALITY YOUNGSTOWN SERVICE

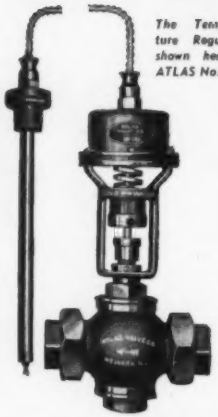
The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.

TEMPERATURE REGULATORS ATLAS



The Temperature Regulator shown here is ATLAS No. 650.

SELF-CONTAINED VAPOR TYPE for LIQUIDS

No. 650—Balanced Type Double Seat Valve, Spring Adjustment. ½" to 2½" inclusive.

No. 651—Needle Type Single-Seat Valve, Spring Adjustment. ½" and ¾".

No. 655—Balanced Type Double Seat Valve, Lever and Weight Adjustment. ½" to 8" inclusive.

No. 660—Single Seat Self-Contained Pilot Operated for High Pressure Steam. ½" to 4" inclusive.

No. 112-651—Combination Temperature and Pressure Regulator. ½" to 3" inclusive.

No. 670—Pneumatically or Hydraulically Actuated. ½" to 8" inclusive.

No. 680—With 3-Way Valve for Mixing Hot and Cold Water. ½" to 2" inclusive.

USE THE COUPON BELOW

ATLAS VALVE COMPANY

289 SOUTH ST., NEWARK 5, N. J.

Represented in Principal Cities

☐ Please send Bulletin 7A on ATLAS Self-Contained Temperature Regulators. ☐ Send Bulletin 6A, Hydraulically and Pneumatically Operated. Also, send data on the ATLAS products checked below.

☐ Damper Regulators ☐ Pump Governors
☐ Campbell Boiler Feed Water Regulators ☐ Oil Control Cocks
☐ Thermostats
☐ Reducing Valves ☐ Balanced Valves
☐ Pressure Regulators ☐ Control Valves
☐ Exhaust Control Systems ☐ Humidity Controllers

Name .....

Firm .....

Address .....

More APPOINTMENTS

Begins on page 228

manager, succeeding O L Wall who died June 29.

Cutler-Hammer, Inc, appoints three sales managers: H B Phillips, quantity sales division; F A Wright, district sales; J M Cook, industrial control divisions.

At **Pittsburgh Steel Co,** Allison R Maxwell Jr is elected vice-president, sales; Marvin J Bair becomes general manager of sales; Norman J Froelich and John C Cercone are assistant general managers of sales.

Paul D Oesterle is appointed sales manager, piping department, at **Dravo Corp.** The **Reliance Electric & Engineering Co** adds four engineers to district sales offices: James M Biggar, Cleveland; Burton B Finigan, New York; Walter A Jensen, Buffalo; Wm C Prettyman, Chicago.

A Callaway Allen becomes sales manager, electrical division, **Wagner Electric Corp.** The **R E Uptegraff Mfg Co** appoints H W Petty sales manager, with offices in Pittsburgh. John R Gilmartin is new general sales manager, Hyatt Bearings Division, **General Motors Corp** and W A Hagen is general sales manager of the United Motors Service Division.

Garlock Packing Co appoints Joe H Dunlevy district manager of the Los Angeles office, succeeding Clarence W Harmon who is retiring. **Howe Scale Co** appoints these new branch managers: Donald P Berne, Minneapolis; Wm J Tucey, San Francisco. **Alloy Steel Products Co** appoints E J Lickwar sales representative in Pittsburgh.

Standard Pressed Steel Co names three additional sales representatives: Marshel Moorhouse, New York City; Walter H Cunnington, St. Louis; James C Humphries, Los Angeles.

Mason C Albrittain becomes general sales manager, **Consolidated Gas Electric Light and Power Co** of Baltimore. Bert L Snell is promoted to assistant general sales manager of the **Luria Engineering Co.** Walter S Schamel becomes district manager of the Los Angeles office for **American Wheelabrator & Equipment Corp;** his new office is at 3155 Leonis Blvd, Los Angeles 58.

New Sales Offices

Electric Machinery Mfg Co opens new sales office at 221 N Second St, Harrisburg, Pa. Richard C Clark is in charge.

Quaker Rubber Corp opens stock-carrying branch warehouse and sales office at 2201 N Washington Ave, Minneapolis, Minn.

Builders-Providence, Inc, and **Omega Machine Co** open new office at Room 207, Congress Bldg, 3527 Broadway, Kansas City, Mo., with Ray W Lindsey in charge.

New Distributors

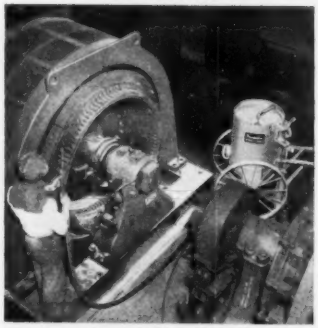
Ampco Metal, Inc appoints Western Oxygen Co, 2949 Sixteenth Ave, SW, Seattle, Wash., and H J Shockey and Associates, 294 Commercial Bldg, Dayton 2, Ohio, exclusive distributors in those areas.

L J Wing Mfg Co adds these sales

Pangborn SAVES

90.9% on materials
66.7% on labor
in cleaning motors!

. . . reports user of Pangborn Corn Cob Blast Machine



Cleaning Duplicate 500 hp Synchronous Motors		
	Material	Labor
Solvent Method	$55.00	120 hrs.
PANGBORN Method	5.00	40 hrs.
SAVING	50.00 (90.9%)	80 hrs. (66.7%)
Remarks: With Solvent, drying period took an additional 8 hours.		

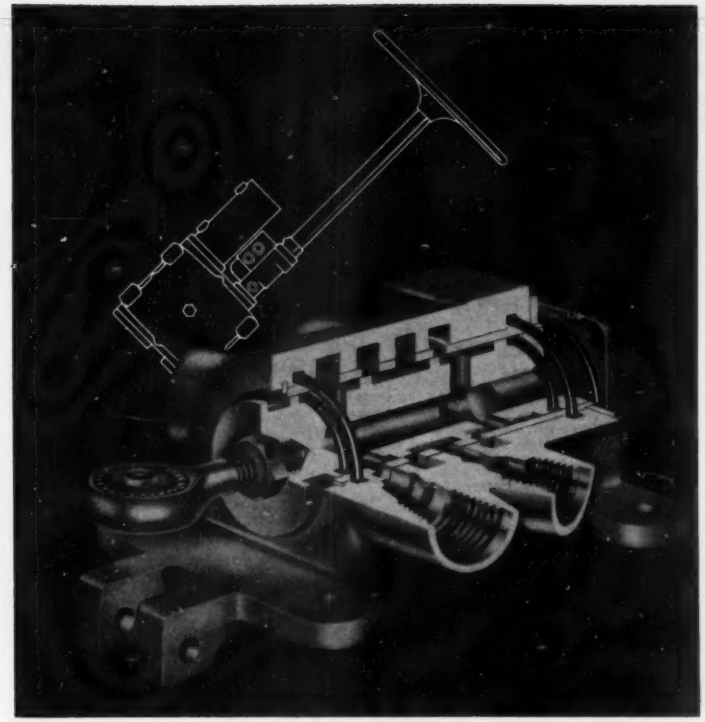
ACTUAL cost-time records prove that the portable Pangborn AC-4 "Corn Cob" Blast Machine scours armatures, parts, frames, coils, etc., in ⅓ the time of other methods. In addition, materials and labor costs are drastically cut, toxic dangers are eliminated, and there's no waiting for parts to dry.

Soft, 20-mesh corncob grits do the job with 40-lb. air pressure, whisking away grease, oil, paint flakes, etc. FOR FULL INFORMATION on how the Pangborn AC-4 can help you, write us and tell us what you clean. Address: PANGBORN CORP., 90 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

Pangborn

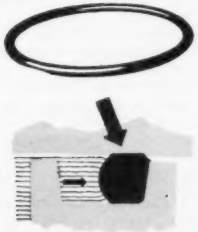
BLAST CLEANS CHEAPER with the right equipment for every job



Cutaway view showing PARKER O-rings in control valve of Ross Hydropower Steering Gear.

PARKER O-RINGS . . . for Simplified Sealing

THIS IS IT



Cross section drawing of O-ring in groove, sealing under pressure.

It's easy to design your product to incorporate PARKER synthetic rubber, *leakproof* O-ring seals. That's why they're economical to use. A simple, small groove is all that's required. There is no structure to support; no added weight. They can be used in either moving or non-moving applications . . . are easy and economical to replace.

PARKER is the one source for *all* standard O-rings to meet specifications covering fuel, hydraulic and engine oil services . . . and for special service O-rings of tested and approved compounds. Ask your PARKER O-ring Distributor (see right) for Catalog 5100, or write The PARKER Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

Parker

TUBE FITTINGS • VALVES • O-RINGS

Plants in Cleveland • Los Angeles • Eaton, Ohio • Berea, Ky.

Parker

O-RINGS

ARE STOCKED BY THESE AUTHORIZED DISTRIBUTORS

AKRON, O.
B. W. Rogers Co.
850 So. High St., Akron 9, Ohio

BOSTON, Mass.
Irving B. Moore Corp.
65 High Street, Boston, Mass.

BUFFALO, N. Y.
Hercules Gasket & Rubber Co.
327 Washington St., Buffalo 3, N. Y.

CHICAGO, Ill.
Air Associates, Inc.
5315 W. 63rd St., Chicago 38, Ill.
Shields Rubber Co.
108 N. Clinton St., Chicago 6, Ill.

CLEVELAND, O.
Cleveland Ball Bearing Co.
3865 Carnegie Ave., Cleveland, Ohio
Neff-Perkins Co.
1360 West 9th St., Cleveland 13, Ohio

DALLAS, Tex.
Air Associates, Inc.
3214 Love Field Dr., Dallas 9, Tex.

DAYTON, Ohio
J. N. Fauver Co.
1534 Keystone Ave.
Dayton 10, Ohio

DETROIT, Mich.
J. N. Fauver Co.
49 West Hancock St., Detroit 1, Mich.

FORT WORTH, Tex.
Adco Industries
3414 Camp Bowie Blvd.
Fort Worth 7, Tex.

INDIANAPOLIS, Ind.
Karhumel Steel & Aluminum Co.
1916 N. Meridian St.
Indianapolis 2, Ind.

KNOXVILLE, Tenn.
Leinart Engineering Co.
412 E. 5th Ave., Knoxville 5, Tenn.

LOS ANGELES, Calif.
Aero Bolt & Screw Co., Inc.
1071 Arbor Vitae Ave.
Inglewood, Calif.
Synthetic Rubber Products Co.
1538 South Eastern Ave.
Los Angeles 22, Calif.

MIAMI, Fla.
Air Associates, Inc.
International Airport, Miami, Fla.

MILWAUKEE, Wis.
Allrubber Products & Supply Co.
612 So. Second St., Milwaukee 4, Wis.

MINNEAPOLIS, Minn.
Van Dusen Aircraft Supplies, Inc.
2004 Lyndale Ave., South
Minneapolis 5, Minn.

NEW YORK, N. Y.
Durham Aircraft Service Co.
5615 Northern Blvd., Woodside, N. Y.
Nielsen Hydraulic Equipment, Inc.
298 Lafayette St., New York 12, N. Y.

PHILADELPHIA, Pa.
Goodyear Supply Co.
1506 Latimer St., Philadelphia, Pa.

PITTSBURGH, Pa.
Shields Rubber Co.
137 Water St., Pittsburgh 22, Pa.

PORTLAND, Ore.
Hydraulic Power Equipment Co.
2316 N. W. Savier St., Portland 10, Ore.

ST. LOUIS, Mo.
Metal Goods Corp.
5239 Brown Ave., St. Louis 15, Mo.

WICHITA, Kan.
Standard Products, Inc.
650 E. Gilbert, Wichita 11, Kan.

CANADA
Railway & Power Engineering Corp., Ltd.

ALLPAX
GASKET CUTTERS

Engineers everywhere are "sold" on these emergency maintenance tools

Hours of time can be saved in meeting emergency requirements for gaskets by having one of these handy, convenient, accurate tools in your plant. The right gasket for *any* need can be cut quickly, safely and economically . . . from such materials as felt, rubber, cork, compressed asbestos sheet, etc. up to ¾" thick. Larger cutter comes complete in metal case with six extra blades and 18" cutting board.

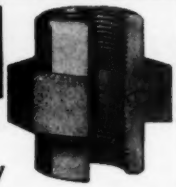
Available in two sizes: for capacities from ¾" to 48" diameter and a "Junior" size for cutting gaskets from ¼" to 6" diameter.

Send for catalog. Distributors in all principal cities.

THE ALLPAX COMPANY INC.
805 Mamaroneck Ave., Mamaroneck, N.Y.

Superheat Sheet Packing . . . Oil Proof Sheet Packing . . . Red Rubber Sheet Packing . . . Diaphragm Sheet Packing . . . Cloth Inserted Sheet Packing

Jefferson
AIR TESTED AIR REFINED MALLEABLE IRON **UNIONS** RECESSED BRASS SEAT



JEFFERSON . . .
the UNION to use to save time, space and money

With a complete range of types from which to choose, users of Jefferson Unions can select those which will simplify pipe installation, provide fewer joints and assure better jobs at lower cost. Note the 45° male-female union elbow among others shown here. This type takes the place of a straight union, nipple and 45° elbow and saves two pipe joints. Behind every type is a specific reason and advantage for using a "JEFFERSON."

Then, too, every Jefferson Union, specialty or flange type, is built around the distinctive, exclusive Recessed Brass Seat which provides straight through, uninterrupted flow through the joint without any possible contact with pipe ends should they be screwed in too far.

This line includes the following unions: Jefferson 300#, AAR 300#, Enduro 300#, Excel 250#, Master 150#, all unions except AAR being available with either brass or all-iron seats.

Get in touch with your nearest distributor or with us direct.

JEFFERSON UNION COMPANY
Manufacturers of Pipe Unions for over 50 years.
605 W. 26th ST., NEW YORK 1, N. Y.
63 Gooding St., Lockport, N. Y. 39 Fletcher Ave., Lexington 73, Mass.

More APPOINTMENTS

Begins on page 228

representatives: Eggelhof Engineers, Inc, Tulsa, Okla., and Houston, Tex.; Engineering Associates, Erie, Pa.; Guy Mankin Jr, Kent, Conn.; Premier Industrial Ltd, Edmonton, Alberta; Industrial Equipment Co, Orlando, Fla.

Raybestos-Manhattan, Inc appoints Webster-Robinson Machy & Supply Co, Inc, distributor in the Tacoma, Wash. area.

Allen-Bradley Co appoints a new commission agent, Robert P Smith & Co, 2031 Hendricks Ave, Jacksonville, Fla.

New Consolidations, Expansions, Addresses

New York Belting and Packing Co has joined forces with the L H Gilmer Co. The organization will continue to operate and be known as New York Belting & Packing Co, with B F Ruether in charge.

Allis-Chalmers Mfg Co has purchased the plant of Victor Electric Products, Inc in Cincinnati, Ohio; this will provide additional space and shipping facilities for *Texrope* drive equipment.

Decentralizations, New Departments

General Electric Co decentralizes its fractional horsepower motor dept into four separate sub-departments, with these general managers: general ac motors, Lisle D Hodell; hermetic motors, Ab Martin; specialty motors, Jack J Clarkson; electric sink and laundry motors, Carl W Moeller. Headquarters for all four groups will be at Fort Wayne, Ind.

Graver Water Conditioning Co creates a new research and product development dept under Vincent J Calise. Marvin Lane becomes technical manager.

Detroit Edison Co sets up new nuclear power development dept, with Harvey A Wagner as coordinator, Edward L Nugent as assistant coordinator.

Anaconda Wire & Cable Co creates new research dept to include the engineering laboratories at Hastings, the magnet wire research laboratory at Muskegon, and the rubber products development laboratory at Marion. H E Thompson is director.

Obituaries

Schuyler C Page, frequent contributor to POWER, and consulting engineer in Rochester, N. Y., died August 29. He had spent a lifetime in installing, operating, and revamping power machinery, see POWER, p 5, December 1951.

Thomas Cruthers, vice-president of Worthington Corp, died at his West Orange, N. J. home on July 27.

Charles W Drake, 73, vice-president and general manager of Byrne Associates, Inc, died July 4 at Freeport, Long Island.

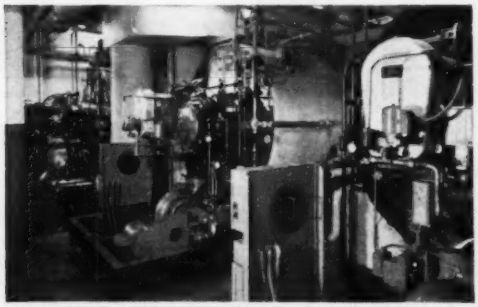
Wm Henry Rea, chairman of board of directors of Detroit Stoker Co, died July 2.

Fred C Hanker, 71, retired Westinghouse engineer, passed away July 26.

In this modern newspaper building passersby can see running presses through 11 ft. plate glass windows, located directly behind flag pole in this picture.

WASHINGTON POST BUILDING, Washington, D. C. Albert Kahn Associated Architects and Engineers, Inc. John McShain, Inc. — General Contractor. Standard Engineering Company, Engineers and Contractors.

THE WASHINGTON POST'S new 7-story building is heated by a combination of a hot blast ventilating system for the inside areas and convector radiation along the outside walls. The steam distribution system is divided into two sections, one supplying the fan blast coils at 3 lbs. to 5 lbs. pressure and one supplying the radiation at 3 lbs. to 5 lbs. pressure.



Three Cleaver-Brooks 150 hp., oil-fired, self-contained boilers were easily and quickly installed in low headroom, basement space.

Three Cleaver-Brooks 150 hp. oil-fired, self-contained boilers, installed in the basement location, supply steam for the entire heating system.

Modern Cleaver-Brooks boilers are increasingly specified for heating service. Completely self-contained and compact in design, requiring minimum headroom and floor area, Cleaver-Brooks boilers offer many installation and operating advantages — oil, gas, or combination oil and gas firing — fully automatic — clean — dependable performance — operate at a guaranteed efficiency of 80%. Available in sizes from 15 to 500 hp., 15 to 250 psi.

Write for the latest, fully illustrated Steam Boiler Catalog — Cleaver-Brooks Company, Dept. L-300 East Keefe Avenue, Milwaukee 12, Wisconsin, U.S.A. *Cable address*: CLEBRO-Milwaukeewis.

Cleaver-Brooks
Originators of Self-Contained
STEAM BOILERS

Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

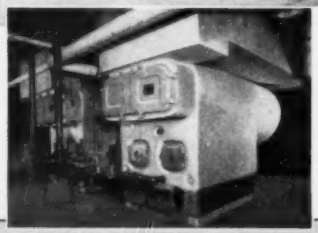
...at Longview, Texas

TITUSVILLE

ALL-WELDED

"WPO" BOILERS

supply plentiful power and heat for the GREGG MEMORIAL HOSPITAL



Two dependable Titusville WPO-130 Boilers, gas-fired, 125 lbs. design pressure, do the job well!

HEATING CONTRACTORS: S. A. Reynolds Plumbing Co.
ARCHITECTS: Wilson, Morris & Crain.
ENGINEERS: H. E. Bovay & Assoc.

Send for your copy of Bulletin B-3030

THE TITUSVILLE IRON WORKS COMPANY

a division of Struthers Wells TITUSVILLE, PENNSYLVANIA

Representatives in Principal Cities

BELMONT

SHEET PACKINGS

ANSWER YOUR NEEDS...

Ever have a packing failure? Then you don't have to be told the high cost of unscheduled maintenance and interrupted service. Knowing the importance of tight, uniformly dependable seals, why not investigate the packings whose performance has identified them with better sealing—LONGER . . . . Belmont's scientifically formulated and controlled sheet packings.

Standard items are offered in sheets or rolls . . . compressed asbestos, asbestos metallic, rubber sheets in all durometer hardnesses including natural rubber and oil resistant synthetics, cloth inserted, vegetable fibre and a variety of other materials and combinations. Belmont Sheet Packings and Gasket Cutters are sold nationally through distributors. Call yours for service or, where technical assistance is required, write direct.

Catalog #40 Available

CUT YOUR
OWN GASKETS
WITH BELMONT GASKET CUTTER
4-M-3A
A portable tool for cutting 1⅛" dia. to 19" dia. circular gaskets from all kinds of soft sheet packings. Rigid and simple to operate. Larger sizes only require cutter bar replacement.

for Steam • Water • Oil • Gas • Air
Acids • Alkalies • Ammonia

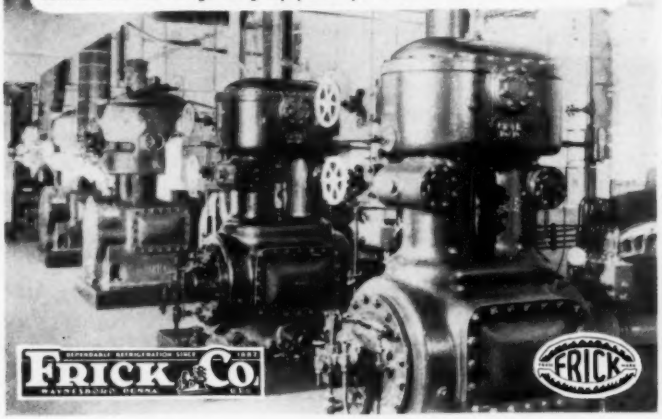
THE **BELMONT**
PACKING AND RUBBER CO.
Butler and Sepviva Streets
Philadelphia 37, Pennsylvania

Rings • Spirals • Coils • Reels
Spools • Sheets • Gaskets
There's a Belmont Packing for every service

Snow Crop Marketers Install Frick Refrigeration

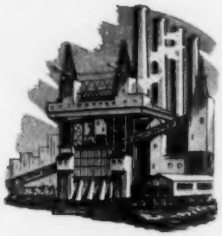
Snow Crop Marketers, a Division of Clinton Foods, Inc., and one of the largest packers of quick-frozen foods in the country, has in operation at Lewiston, Idaho, a battery of five large Frick compressors which produce temperatures as low as minus 40 degrees F. Installation by Lewis Refrigeration and Supply Co., Frick Sales-Representatives at Seattle.

Super-dependability and economy have made Frick refrigerating machines the favorite with quick-freezers, as well as in air conditioning, ice making, and other cooling systems. Ask the nearest Frick Branch or Distributor today for an estimate on the refrigerating equipment you need.



UNSURPASSED

in the Power Field



W-S FORGED STEEL FITTINGS

Screw-End and Socket-Weld Types

Since Watson-Stillman engineers first developed their special line of forged steel fittings to meet the service conditions of the Power Field, the W-S double-diamond trade-marked fitting has been identified with longer, more dependable life and lowest per-year cost in all phases of the industry's operations.

Precision-machined from solid drop-forged steel bodies, Watson-Stillman fittings are much less subject to unscheduled outages than fittings made from other materials or by other methods of fabrication. Being stronger, they are much smaller and lighter . . . bringing economies in weight and space all the way down the line. Their denser, tougher metallic structure is more resistant to corrosion, vibration, shock, and all types of stresses—including internal pressure and creep—than other types.

Yes, there are many reasons why W-S double-diamond fittings are preferred by *all* industries. Want more information? See your Watson-Stillman distributor or write direct.

• Stronger • Smaller • Lighter • Tighter
• More Uniform • Lower Service Cost

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

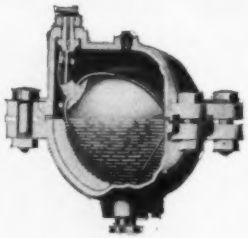
9-M-4

WATSON-STILLMAN
ESTABLISHED 1848

DISTRIBUTOR PRODUCTS DIVISION
ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Hand Pumps, Jacks, Wire Rope Shears, Pipe Benders and Hydraulic Equipment

GET RID OF AIR ACCUMULATIONS IN PIPE LINES...



a BIG Trouble Saver that Costs You LITTLE!

When air lodges at high spots in pipe lines, it reduces the effective area of the pipe, creates a friction head, lowers pumping capacity, and may result in serious water hammer!

Simplex Air Release Valves bring you a sure, efficient cure for these difficulties . . . venting air *automatically before it can cause damage.*

The Simplex Air Valve is easily installed . . . positive in action . . . ample in capacity. Standard valves for pressures up to 250 p.s.i. . . . special valves for pressures up to 800 p.s.i. Thousands have been in successful use for over 30 years.

IT'S SIMPLEX IT'S ACCURATE

Write for free bulletin to Simplex Valve & Meter Co., Dept. 5, 6780 Upland Street, Philadelphia 42, Pa.

SIMPLEX
VALVE AND METER COMPANY

HENSZEY *Boiler Feed* REGULATOR

Keeps a WATCHFUL EYE *on* BOILER WATER LEVELS

• CONTINUOUSLY • AUTOMATICALLY • ACCURATELY

under ALL LOAD CONDITIONS

They help avoid the hazards of high, as well as low, water levels. They function night and day—once installed and set for operation no attention is necessary — nothing to get out of order — nothing to rust.

A simple, compact unit — installs right in the line — no additional supports are necessary. Pressures up to 600 lbs., sizes up to 4 in.

For details consult Sweet's Catalog or write:

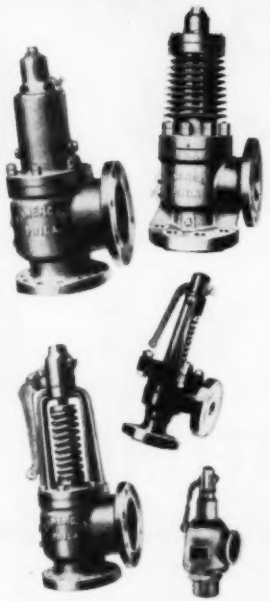
HENSZEY COMPANY
DEPT. D10 WATERTOWN, WISCONSIN

HENSZEY

BOILER FEED REGULATOR

Continuous Blowdown • Distillation Systems • Heat Exchangers
Feed Water Meters • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

A WIDE **SELECTION** FOR POSITIVE **PROTECTION**



For over 80 years Lonergan Safety and Relief Valves have been protecting boilers, compressors, pumping systems and a great variety of process equipment. There is a large variety of *standard* types available. Nearby distributors can supply you.

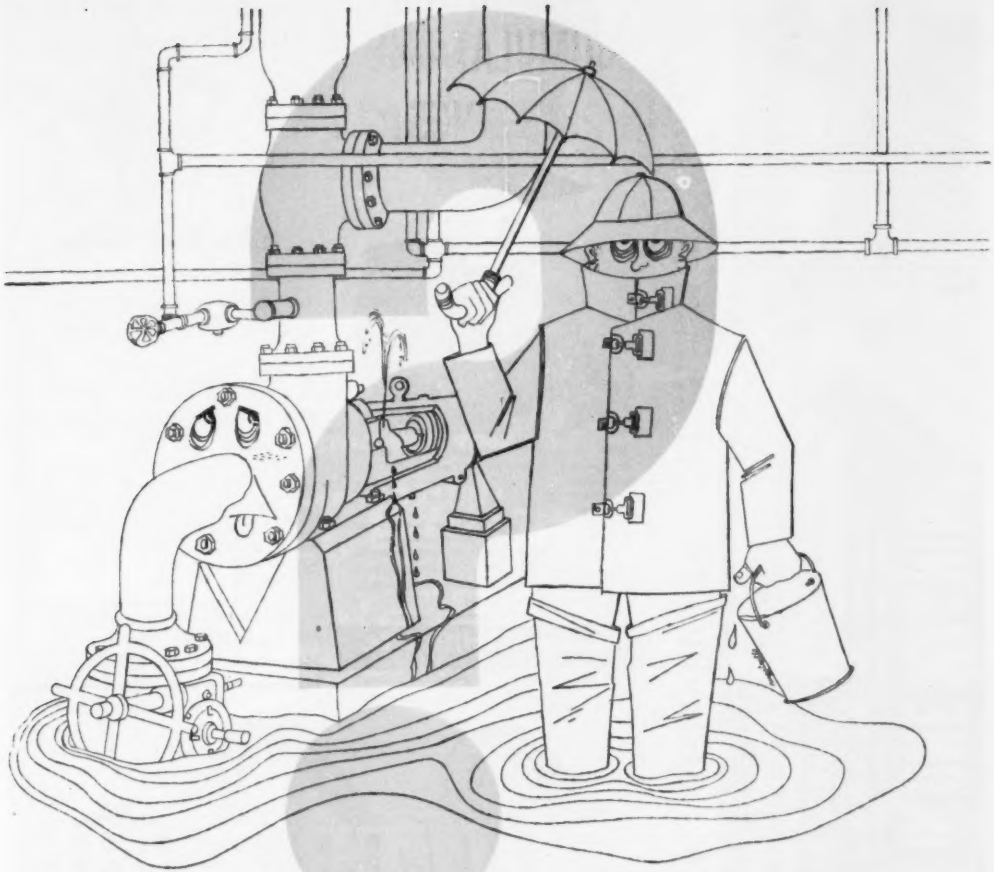
Also GAUGES for every application

16 Types and over 100 models to meet every need. Modern precision movements. Highest standards of instrumentation.

Send for Catalog 800-V

Lonergan

J. E. LONERGAN COMPANY
Race and Second Streets
Philadelphia 6, Pa.
Over 80 years experience.



*Who needs a mechanical seal?**

If you've got hip boots, a bucket and a standby maintenance crew with nothing to do, why bother with a BJ Mechanical Seal? Take a devil-may-care, every-pump-for-itself attitude and let the packing fall where it may. Or if your maintenance department enjoys a "Quick-save-the-dikes" sort of life, they will have great fun poking in packing before the stuff completely goes.

BUT . . . if your business allows little room for exciting crises and repacking picnics, you should know about the BJ Mechanical Seal. This excellent, precision-made seal – available in a number of engineered types – takes the trouble right out of any stuffingbox. There's no leakage . . . no waste . . . no contamination of pumped liquid . . . no volatile liquid hazard . . . no profit-robbing repacking and delivery-delaying downtime.

Maybe *you* need a BJ Mechanical Seal for your BJ Pump. Ask your local Byron Jackson office for details or write:

Byron Jackson Co.

Since 1872

P. O. Box 2017, Terminal Annex, Los Angeles 54, California

OFFICES IN PRINCIPAL CITIES

**BJ Mechanical Seals are made exclusively for BJ Pumps.*

SEE BJ FOR THE ENGINEERED ANSWER TO YOUR PUMPING PROBLEMS

TWO STAGE — DOUBLE ADJUSTment

Two Stage CRUSHING IN ONE MACHINE!

The GUNDLACH "Two Stage" Coal Crusher incorporates two crushing stages in one machine and is designed to reduce RUN-OF-MINE to STOKER COAL in ONE operation. Compact design simplifies structural supports and installation. Rugged simple construction combined with engineering proved in the field makes this machine a profitable and reliable unit.

Fulfilling an urgent need in the industry, the GUNDLACH "Two Stage" Crusher has delivered over 85% usable stoker coal from an Illinois mine run lot.

MATERIAL SIZE CAN BE CHANGED WHILE MACHINE IS RUNNING

All Gundlach Crushers are equipped with Gundlach Patented Crushing rollers. (Pat. No. 2578540)

Crusher is pictured without hopper and sprocket guards, but is delivered complete.

T. J. GUNDLACH Machine Co., Belleville, Ill. WRITE TODAY FOR CRUSHER BULLETIN P-3

A DOZEN STEAM BOILER POINTERS FROM LEFFEL...

Check off the boiler advantages that add up to economy in your plant operation!

- √ Dependable
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- √ Easily Cleaned
- √ Coal, oil or gas fired
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- √ Lowest operating cost
- √ Easily maintained
- √ Maximum combustion

Leffel's generations of boiler-making experience assure you that your next boiler will be your best — if it's a Leffel.

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The James Leffel & Co.
Established 1862

DEPT. O — SPRINGFIELD, OHIO

MARTINDALE PROTECTIVE MASKS

PLACE HEADBAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

Weigh Less than ½ ounce.

Clean, cool, comfortable. Furnish excellent protection against non-toxic dusts except free silica. Replaceable cotton pads are inexpensive and sanitary.

Martindale Protective Masks	$.30 ea.
No. 1 Refills (Standard weight)	.02 ea.
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Masks packed in individual envelopes. Refills packed in envelopes containing 25. No. 2 (heavyweight) Refills contain twice as much filtering cotton as No. 1.

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BOILER TUBE CO. OF AMERICA
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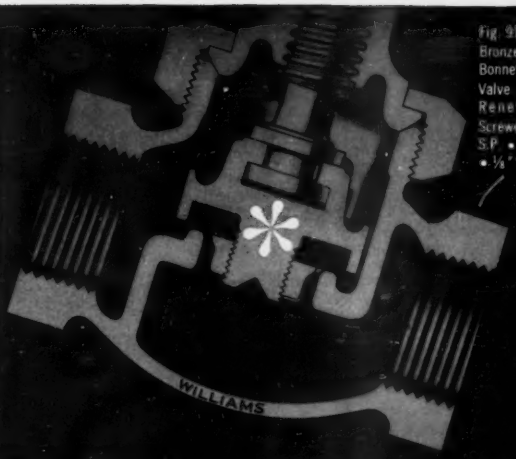

Fig. 912—913
Bronze Vulcodisc Union Bonnet Globe and Angle Valve • Integral or Renewable Seat • Screwed Ends • 200 lbs. S.P. • 400 lbs. W.O.G. • ⅛" to 3".

REDUCE COSTLY "SHUTDOWN" TIME . . .

Specify D.T. Williams "Vulcodisc" Valves

RUGGED CONSTRUCTION! Valve is quality engineered from high grade steam bronze for greatest wall strength —longest service life!

RENEWABLE DISCS! Can be quickly replaced without removing valve from line—prevent service delays!

SPECIAL "VULCO" DISC COMPOSITION! Allows foreign matter to impregnate disc harmlessly—prevents shutdowns due to disc chipping or cutting.

3 DIFFERENT DISCS AVAILABLE! Three special composition discs are available for use in Vulcodisc Valves. Fig. 825 for steam, Fig. 826, air and water, Fig. 827, oil or solvents.

For additional information either see your nearest jobber or write for literature.

Fig. 1176

Fig. 1176
Bronze Vulcodisc Quick Operating Union Bonnet Globe Valve • Screwed Ends • 200 lbs. S.P. • 400 lbs. W.O.G. • ¼" to 2"

Fig. 840

Fig. 840
Bronze Vulcodisc Quick Operating Valve • Screwed Ends • 200 lbs. S.P. • 400 lbs. W.O.G. • ¼" to 2"

Fig. 856

Fig. 856
Bronze Vulcodisc Horizontal Check Valve • Screwed Ends • 200 lbs. S.P. • 400 lbs. W.O.G. • ⅛" to 3"

Fig. 1086

Fig. 1086
Bronze Vulcodisc Swing Check Valve • Screwed Ends • 200 lbs. S.P. • 400 lbs. W.O.G. • ¼" to 3"

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THE D. T. WILLIAMS VALVE CO.
FOUNDED 1904
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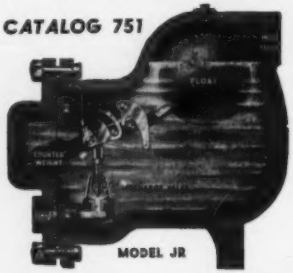
Cannot Leak Live Steam

Even though re-evaporation completely dries up its body, a Nicholson weight-operated trap will not leak live steam. These units do not depend on buoyancy of float to raise valve. Other features: large orifices keep valve clean; non-wire drawing; rugged for unavoidable abuse; not easily affected by dirt, pulsation; of stainless steel where it counts. Widely used for steam purifiers, super-heated steam lines, headers, separators, heaters, dry kilns, pipe coils, turbine throttle valve drips, stop and check valves, etc. Also for air and gasoline.

CATALOG 751



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4 TYPES—press. to 200, 500, 650, 1500 lbs.; for every large-capacity, heavy-duty use.

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PUT UP TO STAY UP!

That's the word of a large midwest manufacturer. Twenty-one years of service without need for repairs prove to him that, with a GRID installation, first cost is LAST COST. Such service records (GRID installations made in 1929 are still operating) are the rule rather than the exception with GRID Unit Heaters because GRID was deliberately designed to be a better unit heater. To provide not only ample, comfortable heat, but to give years of service without the usual high maintenance cost generally experienced with ordinary unit heaters.

Such service records occur because GRID is completely different from other unit heaters—Here's how:

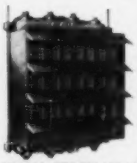
GRID is an all cast unit with finned heating sections and headers tested to withstand steam pressures up to 250# P.S.I.

GRID construction uses no brazed, soldered, rolled or welded connections between condenser and headers. A specially designed threaded nipple assures a precision, leak-proof fit.

GRID construction has all similar metals in contact with steam, thus preventing electrolytic corrosion which eventually occurs in copper type unit heaters where steam passes from iron pipes into copper cores. (Write for booklet CORROSION IN UNIT HEATERS).

GRID construction resists corrosion from fumes present in most types of industry.

GRID design incorporating low outlet temperatures, proper fan sizes and motor speeds, assures delivery of warm comfortable air in ample volume to the working level. No stratification of warm air at the ceiling to waste your fuel dollars.



These are the reasons why users of GRID Unit Heaters get 21 years and more of trouble-free service. There are units cheaper than GRID, but there is none better.

You start saving money the day you install GRID Unit Heaters.

GET THE COMPLETE GRID STORY—WRITE FOR CATALOG CUH-546-A.

GRID Blast Coils are ideal for process drying—Write for Catalog BC-1049.

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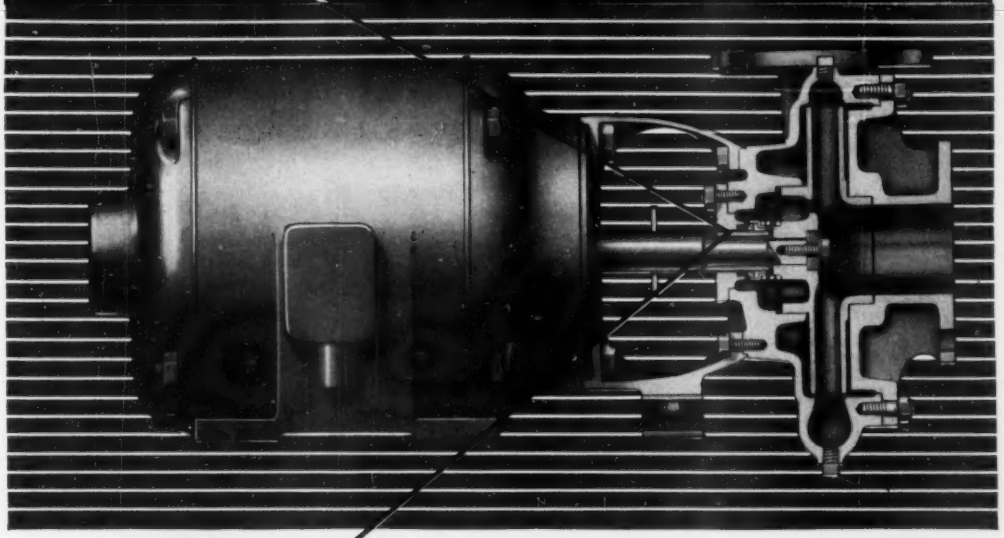
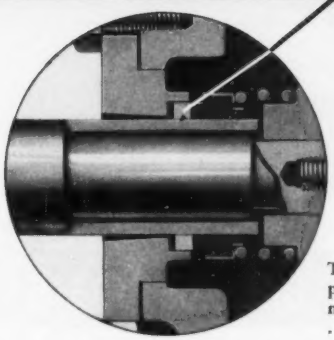
NEW *Remite* SEAL ENDS LEAKAGE TROUBLES





Cross-section showing Remite Mechanical Seal.

B&G *UNI-BUILT*

SERIES 1531 CENTRIFUGAL PUMP

The "REMITE" Mechanical Seal of this pump presents a revolutionary new development in pump design . . . eliminates leakage . . . assures long, trouble-free life.

A carbon seal ring faces on a "REMITE" floating seat—a new type of material, *so hard it will scratch glass*—wear-proof and corrosion-resistant! This Seal is self-lubricating.

Note the pump shaft . . . super-finished high grade steel . . . oversized for minimum deflection . . . quiet. The impeller is of sound hydraulic design, mechanically balanced, with balance ring and relief holes to reduce thrust. The heavy duty ball-bearing motor is normally furnished as drip-proof, but is also available in splash-proof, totally enclosed and explosion-proof models.

B & G Series 1531 Uni-built Pumps are made with capacities to 1200 GPM, heads to 400 feet.

Send today for catalog No. ET-452, giving complete engineering data on the B & G Series 1531 Uni-built Centrifugal Pump.

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X-14

No Water Hammer! No "Hunting!"
DAVIS No. 60 FLOAT VALVE

The Davis No. 60 Float Valve, illustrated here, is unexcelled for dependable performance. It handles either hot or cold water with no "hunting," no "water-hammering." Opens easily against any pressure up to 125 p.s.i. and closes positively drip tight. No sticking; there is no internal packing to swell and cause excessive friction. Built in sizes, ½" to 12". Standard construction — composition disc, bronze trim. All bronze or stainless trim available. Contact your distributor or write.

No. 60
- Single seat; pilot stem.
- Tight closing; non-sticking.
- Renewable disc; no internal packing.

DAVIS REGULATOR CO.
Established 1875
2540 So. Washtenaw Ave. Chicago 8, Ill.

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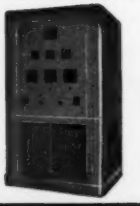

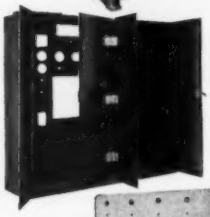

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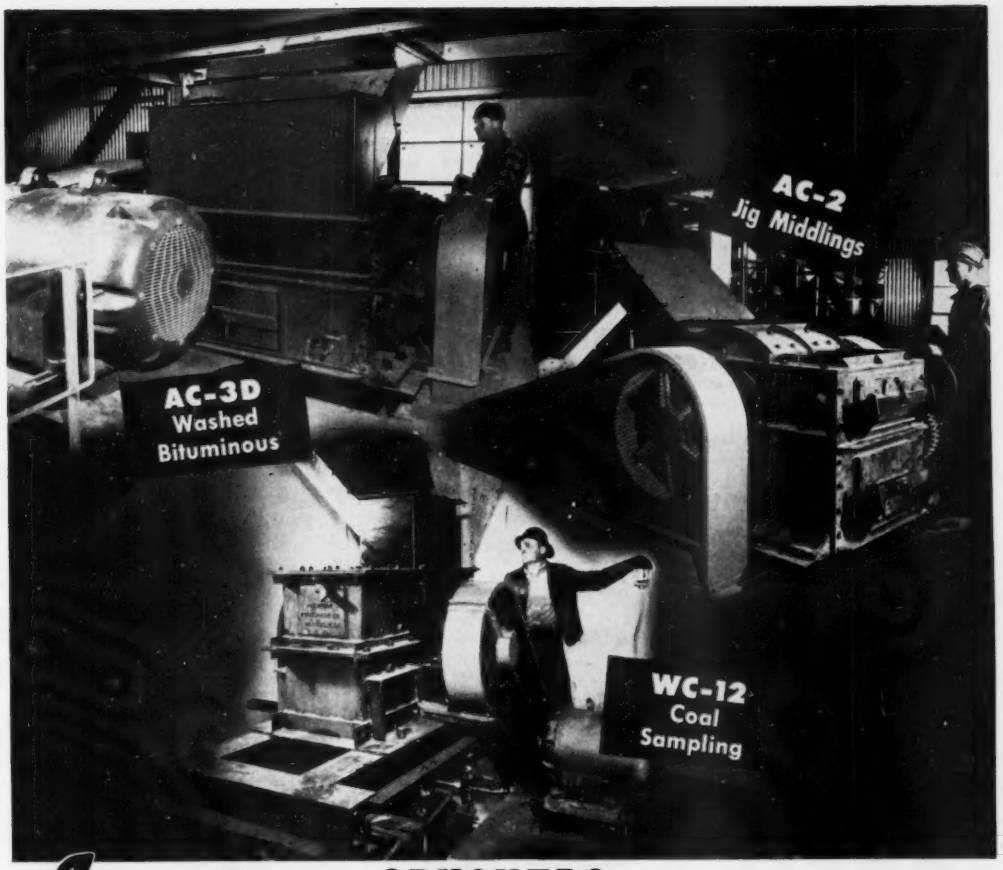

American CRUSHERS SENTENCED TO 20 YEARS HARD LABOR!

at Crown Mine by Roberts and Schaefer

Still in faithful operation all over America, are scores of 20-year-and-older American Crushers. The latest to begin a similar term of long, dependable service are the three Crown Mine installation at Farmersville, Illinois — each designed to do a specific job:

- **AC3-D.** For crushing washed bituminous coal. Capacity 275 TPH, from 6" x 1½" to minus 1½".
- **AC-2.** For jig middlings. Capacity 80 TPH. From 6" x 1½" jig middlings to minus 1¼".
- **WC-12.** For coal sampling. Capacity 7 TPH. From 1½" x 0" to 100% passing ¼" screen, and 95% passing ⅛" screen.

The wisdom of this choice has been proved again and again by past performers—American Crushers are consistently crushing coal at a total cost of LESS THAN 1 CENT PER TON (including interest on original investment, depreciation, replacement parts and power).

WRITE for complete information on AMERICAN COAL CRUSHERS.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1349 Macklind Ave.
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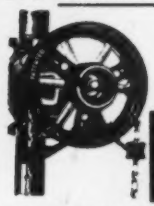
NOW! All Overhead Valves are Instantly Accessible with the LOW-COST Babbitt Adjustable SPROCKET RIM with Chain Guide



• Range of 10 adjustable sizes takes care of all valve makes and types; fits valve wheel diameters from 2 to 30 inches.

• Overhead valves — no matter how high up, or in whatever hard-to-get-at location — are instantly accessible from the floor! Operation of valves is quick, easy, positive and safe with the BABBITT Adjustable Sprocket Rim with Chain Guide. No more climbing on bench, machine, boiler or treacherous stepladder; no time-wasting.

• The BABBITT Adjustable Rim fits all valves, with either rising or non-rising stems. It is installed quickly by clamping onto the hand wheel of the valve.

• Write today for Catalog Bulletin P, surprisingly low prices, and name of nearest distributor.

BABBITT STEAM SPECIALTY CO.
1 Babbitt Square, New Bedford, Mass.

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made plain for those who INSTALL, USE, and MAINTAIN control devices

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PRACTICAL INDUSTRIAL ELECTRONICS

By F. A. ANNETT
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381 pages, 369 illus., $5.50

IN down-to-earth language this practical book describes such devices as electronic heating system controls, automatic electronic combustion control, magnetic drive-speed control. It shows you how motor generator exciters work—explains the function of liquid level and pump controls. It clearly discusses the application, circuits, and operation of rectifiers, relays, oscillators, smoke indicators, and recorders, combustion safeguards, motor-speed controllers, etc.

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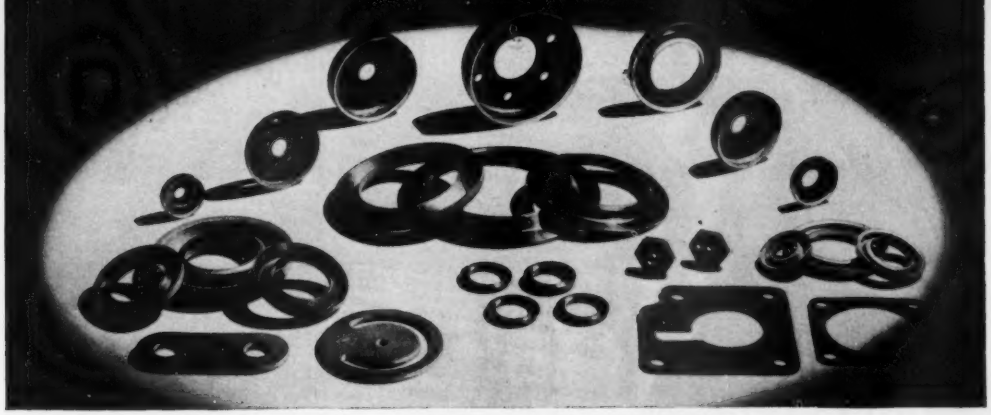
Write or see your Murray representative for detailed information, on single stage or multi stage turbines—for high, low or inter-mediate pressure applications.

MURRAY IRON WORKS CO. BURLINGTON IOWA

GARLOCK Service-Tested LEATHER PACKINGS



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Garlock's modern, completely equipped leather packing manufacturing plant has the facilities to furnish *all types* of leather packings. This plant maintains the same high standards of materials, design, workmanship, and inspection that Garlock has upheld for the past 65 years in the manufacture of mechanical packings.

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Molded Cups **"U" Packings** **"V" Packings**
Washers **Gaskets** **Discs** **Flange or Hat Packings**

SIZES

All sizes suitable for leather packing applications from 1/8" outside diameter (such as leather washers for needle valves) to 99" outside diameter (such as large "U" packings for heavy duty hydraulic service).

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Oak **Chrome** **BITAN***

Garlock Bitan combines the heat and oil-resisting qualities of chrome with the fine grain, non-porous and strong qualities of oak.

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Oil, grease, or wax treated (and combinations of these impregnants)—in degrees of hardness from extremely soft and flexible to very hard and rigid.

Synthetic rubber impregnated—combines the high tensile strength of leather and elasticity of rubber, and gives greater temperature resistance.

With fabric liners.

Untreated—for certain low pressure water applications.

Put your leather packing problems up to Garlock. Contact your Garlock representative or write for leather packing folder today.

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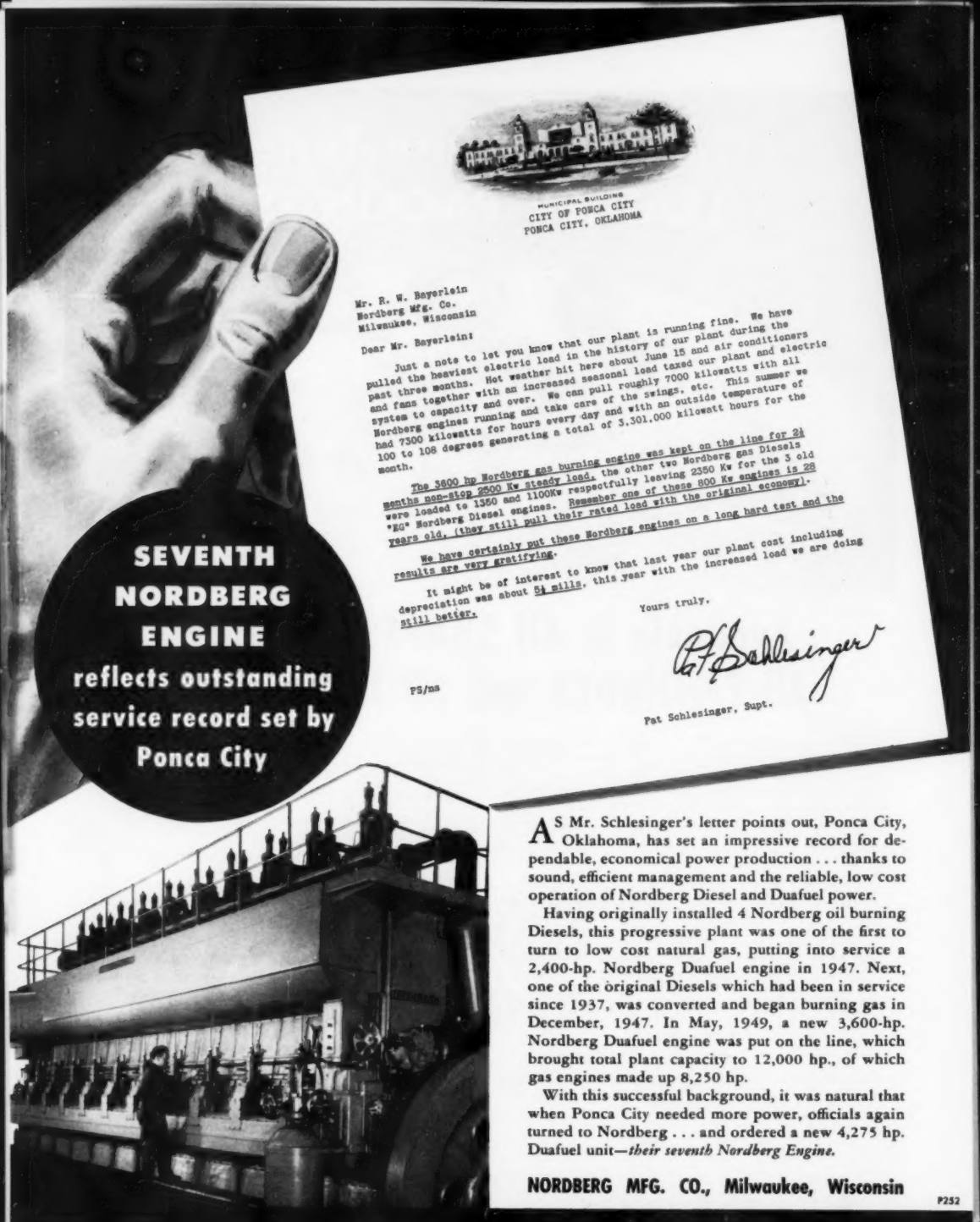
MECHANICAL SEALS,
RUBBER EXPANSION JOINTS**


MUNICIPAL BUILDING
CITY OF PONCA CITY
PONCA CITY, OKLAHOMA
Mr. R. W. Bayerlein
Nordberg Mfg. Co.
Milwaukee, Wisconsin
Dear Mr. Bayerlein:
Just a note to let you know that our plant is running fine. We have pulled the heaviest electric load in the history of our plant during the past three months. Hot weather hit here about June 15 and air conditioners and fans together with an increased seasonal load taxed our plant and electric system to capacity and over. We can pull roughly 7000 kilowatts with all Nordberg engines running and take care of the swings, etc. This summer we had 7300 kilowatts for hours every day and with an outside temperature of 100 to 108 degrees generating a total of 3,301,000 kilowatt hours for the month.
The 3600 hp Nordberg gas burning engine was kept on the line for 2½ months non-stop 2600 Kw steady load, the other two Nordberg gas Diesels were loaded to 1360 and 1100Kw respectfully leaving 2350 Kw for the 3 old "Es" Nordberg Diesel engines. Remember one of these 800 Kw engines is 28 years old, (they still pull their rated load with the original economy).
We have certainly put these Nordberg engines on a long hard test and the results are very gratifying.
It might be of interest to know that last year our plant cost including depreciation was about 5¼ mills, this year with the increased load we are doing still better.
Yours truly,
Pat Schlesinger
PS/ms
Pat Schlesinger, Supt.

SEVENTH NORDBERG ENGINE reflects outstanding service record set by Ponca City

AS Mr. Schlesinger's letter points out, Ponca City, Oklahoma, has set an impressive record for dependable, economical power production . . . thanks to sound, efficient management and the reliable, low cost operation of Nordberg Diesel and Duafuel power.

Having originally installed 4 Nordberg oil burning Diesels, this progressive plant was one of the first to turn to low cost natural gas, putting into service a 2,400-hp. Nordberg Duafuel engine in 1947. Next, one of the original Diesels which had been in service since 1937, was converted and began burning gas in December, 1947. In May, 1949, a new 3,600-hp. Nordberg Duafuel engine was put on the line, which brought total plant capacity to 12,000 hp., of which gas engines made up 8,250 hp.

With this successful background, it was natural that when Ponca City needed more power, officials again turned to Nordberg . . . and ordered a new 4,275 hp. Duafuel unit—*their seventh Nordberg Engine.*

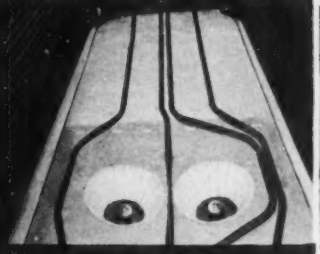
NORDBERG MFG. CO., Milwaukee, Wisconsin

P252

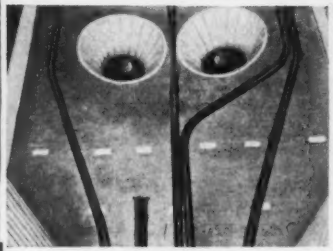
BUSCH-SULZER
A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES

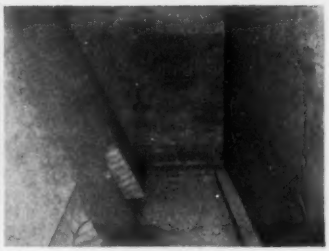
75,000
STEAM GENERATOR
Completely Lined with
PLASTIC and CASTABLE
REFRACTORIES



Keep Furnaces in Operation Longer



Monolithic front wall from ash hopper to top of pulverized coal burner is constructed with SUPER HYBOND . . . a high strength super duty plastic firebrick.



A. P. Green KAST-SET refractory castable was used in pouring the ash hopper shown here. Monolithic baffles and top deck were also poured with KAST-SET.

with A. P. GREEN Engineered Monolithic Linings

When you specify A. P. Green monolithic construction, you get an airtight, one-piece refractory lining in each section of the furnace. The photographs above show a recently completed, steel encased monolithic installation in a large, 75,000 lb. per hr. Riley steam generator. The various sections of this furnace are lined with SUPER-PLASTIC and SUPER HYBOND plastic firebrick, and KAST-SET and KAST-O-LITE castable refractories . . . each product designed to meet the conditions encountered in the particular section in which it is installed.

A. P. Green monolithic linings eliminate air infiltration, are resistant to spalling and lose less heat through walls. A. P. Green floating anchors compensate for differential in expansion between the refractory wall and the outer wall.

For any refractory need, call your local A. P. Green distributor; he's listed in the yellow pages of your telephone directory . . . or write direct.

A. P. Green
REFRACTORY
PRODUCTS

IN PRINCIPAL CITIES OF THE WORLD

Complete Facilities

...for Every Power Piping Job

Simplify your next power piping installation—turn the entire job over to P.P.& E. Here's how you benefit:

- Far less detail work for you.
- Correct interpretation of your blueprints.
- Efficient detailing of shopwork for best coordination with field requirements.
- Maximum amount of system prefabricated, stress-relieved, model-tested, as well as tested under ideal shop conditions.
- Field erection supervised by specially-trained personnel, with minimum waste motion.

And—you gain the use of the diversified practical experience with all types of high-pressure, high-temperature piping that we have acquired in 50 years of specialization in this field.

Pittsburgh Piping
AND EQUIPMENT COMPANY
10 Forty-Third Street — Pittsburgh, Penna.

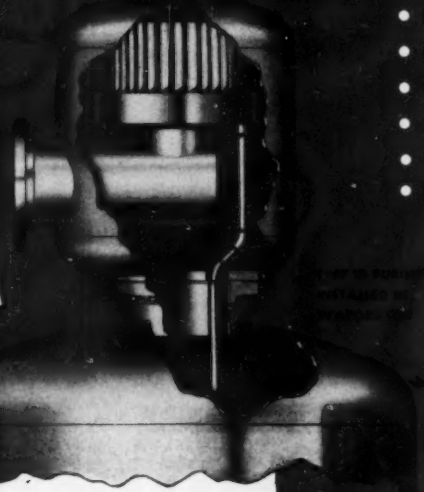
Woolworth Building, New York
Whitehead Building, Atlanta
Book Tower, Detroit
785 Market Street, San Francisco
Peoples Gas Building, Chicago
Public Square Building, Cleveland
10 High Street, Boston
Heights State Bank Bldg., Houston

What are you doing about the third control?

3 ENTRAINMENT CONTROL

2 TEMPERATURE CONTROL

1 PRESSURE CONTROL



- STEAM DRUMS
- AIR TANKS
- EVAPORATORS
- PACKED TOWERS
- DEODORIZERS
- STILLS
- BUBBLE-CAP TOWERS
- RECEIVERS

• Frequently you give serious thought and attention to *pressure* and *temperature control.* This is quite natural because it means better operation and more production and often prevents damage. But what about the *third control—entrainment control.* Lack of this control can be just as costly as lack of pressure and temperature control.

Lack of the third control can mean shut downs and loss of production due to entrainment wear in engines and process equipment. Larger slugs of entrainment have been known to blow off cylinder heads of reciprociting engines and to ruin thrust bearings of turbines.

Lack of third control means poor efficiency of superheaters, steam ejectors, dryers and other equipment. It means dirty pipe lines and fouled valves.

End this damage *once and for all* with Hi-eF Purifiers. They remove 99% of all entrainment. Individually guaranteed, Hi-eF Purifiers are the most economical protection you can buy . . . they cost no more than an ordinary separator. Write us today about your entrainment problem. Let our engineering staff, without the slightest obligation, give you the proper solution.

See our exhibit booths 83 and 84 at the 20th National Exposition of Power Mechanical Engineering

ANDERSON Hi-eF PURIFIERS

PURIFIER DIVISION,

THE V. D. ANDERSON COMPANY

1934 West 96th Street • Cleveland 2, Ohio

Gentlemen: Please send additional information on Anderson Hi-eF Purifiers.

Name.....

Company.....

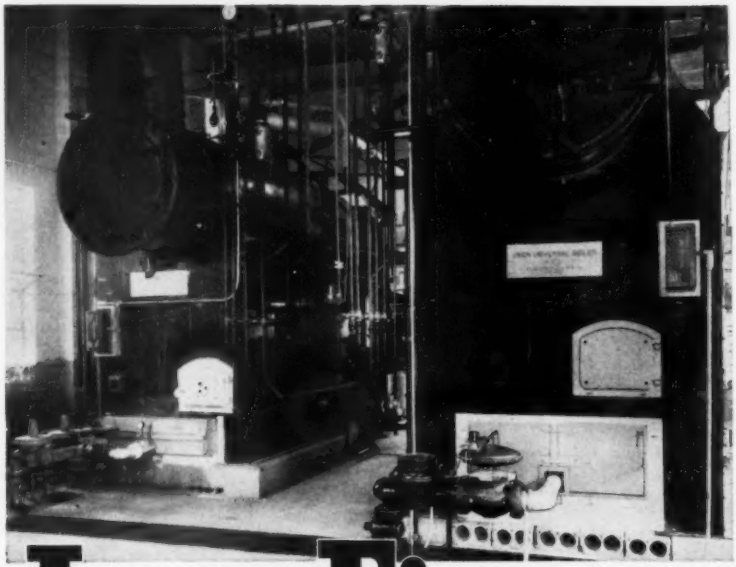
Address.....

City.....Zone..State.....

"Our Iron Fireman Gas Burners maintain a more even steam pressure and save manpower"

says Mr. O. Carlyle Brock
President, Sanida Sanitary Farms Dairy, Inc.
Erie, Pennsylvania

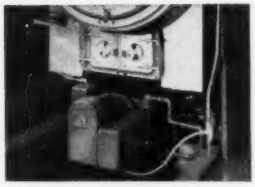
"Our original boilers were coal fired, and since changing to your gas burners, we can maintain a more even steam pressure and are experiencing considerable savings in manpower. Our load changes quite rapidly and at no time have we been held up for lack of steam. We are also able to maintain a clean boiler room which is quite important in dairy operations."



Both boilers at Sanida Dairy (100 h.p. and 150 h.p.) are fired by Iron Fireman GCR vertical-type Gas Burners. Zone fire control permits low-fire start and self-adjusting modulated firing. Automatic damper controls enable rapid heat response.

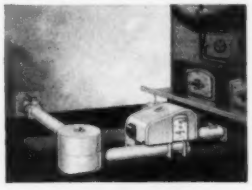
Iron Fireman Gas Firing for heating, power, or processing

Iron Fireman gas firing is saving users many fuel dollars. "Control" is the answer—control of the fuel-air ratio for the most efficient combustion; *control* of the firing rate to instantly adjust to the load; and *control* to compensate for varying pressures in the gas supply. No other gas firing gives such outstanding performance and savings. They are available in three styles—inshot burners, vertical-type burners, and ring-type burners, for boilers up to 1,000 horsepower. Find out how much an Iron Fireman can save for YOU. Phone your nearest dealer or send the coupon below for descriptive literature.



Horizontal Rotary Oil Burner

Fires low-cost, heat-rich heavy oils (Nos. 5 and 6) with complete steadiness and dependability. Oil feed rate is constant, even with changes in viscosity of oil.



Coal-Flow Stoker

Feeds coal direct from bin. No coal handling. Synchronized coal and air supply automatically adjusted to boiler load at all times. Capacities to 400 boiler h.p. Pneumatic Spreader models also available

MAIL COUPON FOR FULL INFORMATION

IRON FIREMAN MFG. CO. 3250 W. 106th Street, Cleveland 11, Ohio

Please send literature as checked:

- ☐ Commercial Gas Burners
- ☐ Coal-Flow Stokers
- ☐ Rotary Oil Burners
- ☐ Pneumatic Spreader Stokers

Name_____

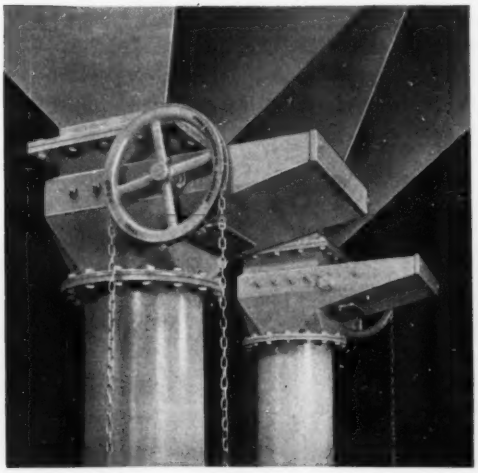
Address_____

City_____ State_____

AUTOMATIC FIRING FOR HOMES, BUILDINGS, INDUSTRIAL PLANTS

The Operator With a Sledge Hammer

S-E-Co. Coal Valves, available in sizes up to 42", are used in many central stations and large industrial plants.

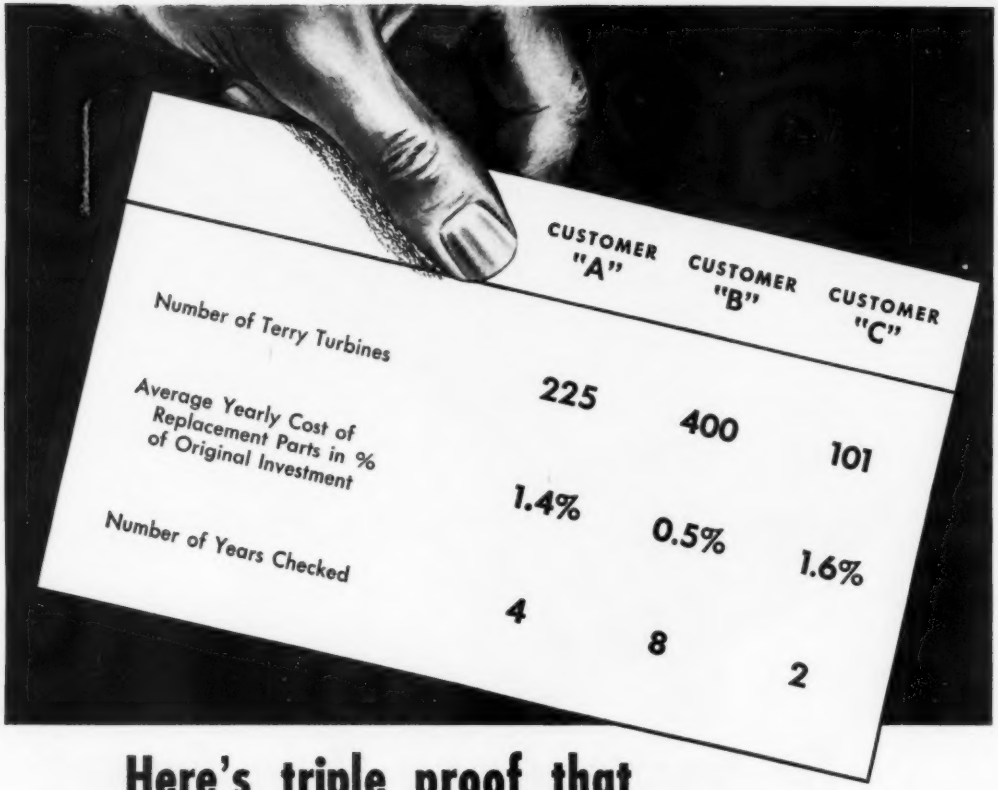


knows how to keep coal moving. But the anvil chorus he beats out on the bunker, valves and downspouts is far from pretty. It tells of damaged equipment — shoddy in appearance and short in life expectancy.

A sledge hammer does not belong in a modern boiler house. It is not a reliable means of overcoming coal stoppage, and when using it, the operator must neglect the economical operation of his boilers.

The best solution to the problem of coal stoppage is proper design of "Bunker to Pulverizer" or "Bunker to Stoker" equipment. As specialists in this field, Stock Equipment Company is in a position to assist plant designers with this problem on new plant design or renovation of existing facilities. Proper size of coal valve, proper slope to downspouts and proper shape of hoppers will do more to retire the sledge hammer from the boiler house than any other approach to the problem. Write for assistance with your particular coal flow problem.

STOCK EQUIPMENT COMPANY
745 P HANNA BUILDING
CLEVELAND 15, OHIO



Here's triple proof that
IT PAYS TO SPECIFY TERRY TURBINES

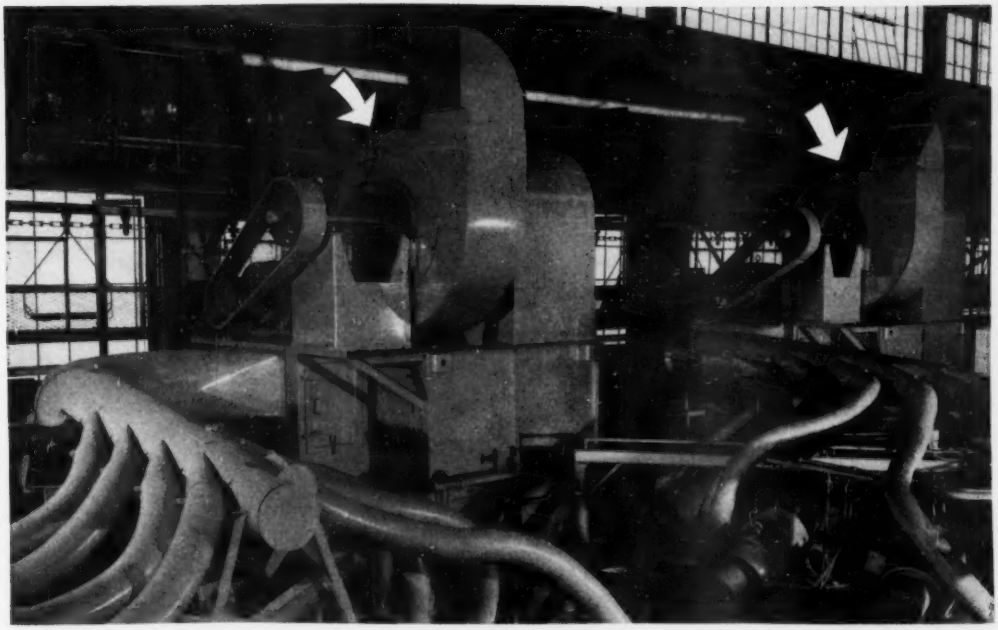
When you combine the figures for these three customers — a total of 726 turbines — the average yearly cost of replacement parts works out to only 1.1% of the original investment. A truly remarkable record, even when you realize that they are Terry turbines.

But, the cost of replacement parts is only the beginning of the story. The real savings are in the labor costs and production losses which are reduced so drastically when you install Terry turbines.

Send for further information about these low-maintenance turbines. Bulletin S-116 describes the many advantages of the Terry solid-wheel turbine. For multistage turbines, ask for a copy of Bulletin S-146.

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TT-1196



Another Clarage Installation in One of America's 97* Largest Industrial Enterprises

***97**

OF AMERICA'S 100 LARGEST CORPORATIONS

are users of Clarage equipment . . . This wide acceptance denotes the high quality and reliable performance of Clarage products.

Above you see two of the twelve Clarage Improved Exhausters on a vital-to-production dust collecting job in the Monroe, Michigan plant of the Ford Motor Company.

These twelve fans operate in connection with twelve American Air Filter Company's Roto-Clone installations.

Ford Motor Company has used Clarage equipment for over a quarter century.

Counting all of this Company's plants, well over a thousand Clarage fans are now handling the many and varied air handling requirements of this leading automotive and defense materiel manufacturer.

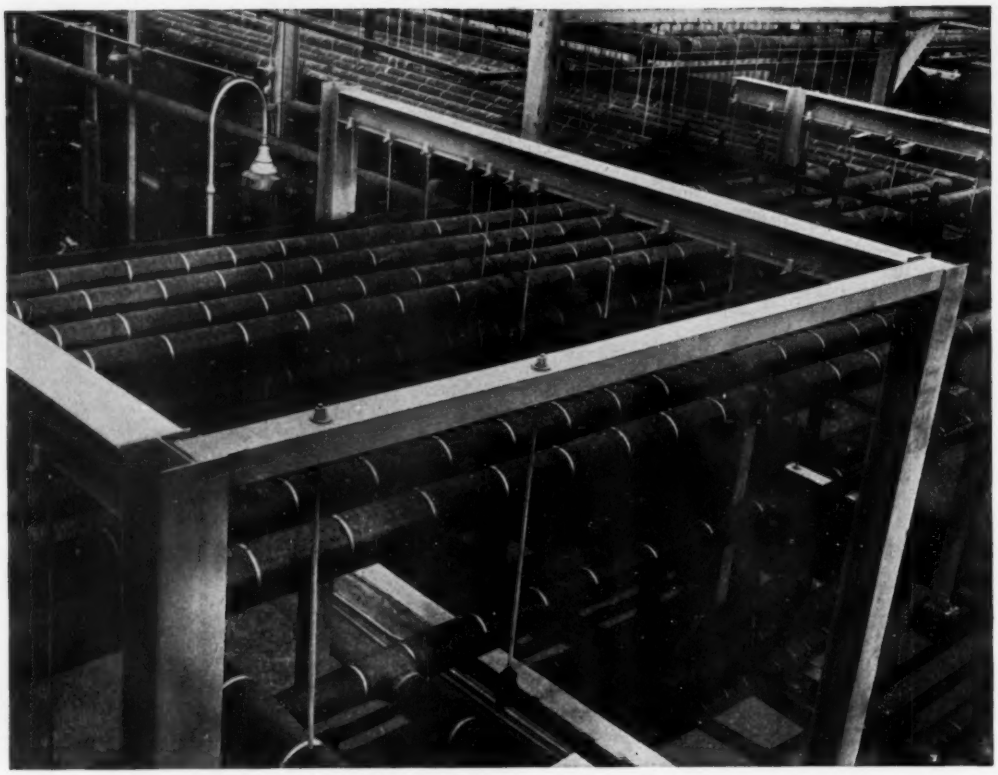
You can RELY on Clarage equipment to give you economical service for a long time to come. CLARAGE FAN COMPANY, 615 Porter Street, Kalamazoo, Michigan.

You can Rely on...

CLARAGE

Headquarters for Air Handling and Conditioning Equipment

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans Ltd., 4285 Richelieu St., Montreal



Outdoors, too, you can count on

"FEATHERWEIGHT" 85% Magnesia

You don't have to pamper "Featherweight" 85% Magnesia! This versatile, dependable insulation does the same efficient job outdoors as well as indoors, on any heating application up to 600°F.

The photograph above shows a part of one of the largest outdoor installations of its kind. The thousands of feet of pipe in this project carry various liquids and gases at many different temperatures. Some of the lines are traced with steam in ½" iron pipe; other lines are steam jacketed. In every case it is important that critical temperatures be held as closely as possible.

"Featherweight" 85% Magnesia, with a weatherproof covering, is an efficient insulation for this application. It will undoubtedly last the life of the plant—and *never* lose its efficiency!

Such service is to be expected of this remarkable material. "Featherweight" 85% Magnesia is structurally strong. It withstands reasonable compression, vibration, and contact. It is physically inert, and its insulating qualities are unaffected by alternate heating and cooling. It is entirely mineral, thus, will not burn. When used along with K&M Hy-Temp Insulation, its usefulness is extended to applications up to 1900°F.

Your Keasbey & Mattison Distributor is an experienced applicator able to answer your questions about "Featherweight" 85% Magnesia. See him, or write us direct for more information.

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

K&M best in asbestos ®

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA
In Canada: Atlas Asbestos Company, Ltd.
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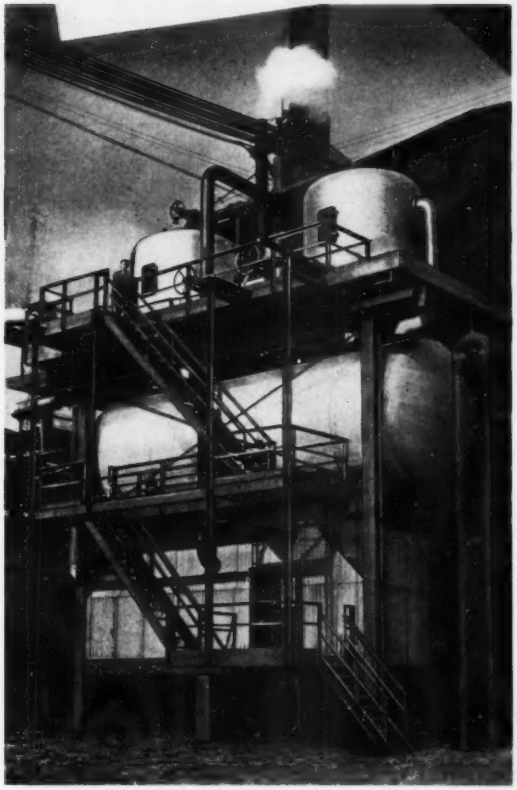
THIS DEAERATION PROBLEM

1,000,000 pounds of highly corrosive encrusting feedwater, with hardness up to 35 ppm and temperature at 60F, to be deaerated for boilers operating under *variable load* conditions at 225 psig and 575-600F at a large eastern steel mill.

Solved by Graver



THE GRAVER SOLUTION

Two Graver Spray-Tray Deaerating Heaters mounted on a single horizontal storage tank and equipped with internal vent condensers.

Graver non-clogging, non-corrosive spray valves are used for first-stage deaeration, and stainless-steel non-corrosive trays are used for second stage deaeration.

A Graver internal vent condenser eliminates the possibility of tube scaling which would occur in an external tubular condenser at lower load conditions.

THE GRAVER PERFORMANCE

Even under varying load conditions, tests show that O_2 is kept below 0.005 ml/l, and the entire installation operates without any maintenance attention.

• • • • •

Graver can help solve *your* deaeration problem, too. The more than 40 years of specialized experience of the Graver water conditioning engineers is at your service. Write for free copy of "Trends in Application of Deaerating Heaters for Treating Boiler Feedwater"

Visit our Booth 541-542 at the Power Show, New York December 1-6, 1952

GRAVER WATER CONDITIONING CO.
Division of Graver Tank & Mfg. Co., Inc.
Dept. P-H, 216 West 14th Street, New York 11, N. Y.
In Canada: The Bird-Archer Co., Ltd.; Cobourg, Ontario
In Mexico: Proveedores Tecnicos, S.A.; Puebla 259, Mexico 7, D. F.

GRAVER Deaerating Heaters

GW 463

Noise Reduction
plus waste heat utilization
Snubbers

Noise Reduction
plus spark arresting
Snubbers

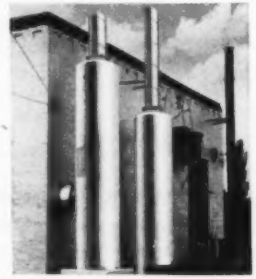
Noise Reduction
plus surge control
Snubbers

Noise Reduction
plus air cleaning
Snubbers

Noise Reduction
plus water separating
Snubbers

Service to Industry

Do you have a noise problem dealing with Diesels or gas engines, jets, turbines, steam discharge, vacuum pumps, or compressors? If so, Burgess-Manning engineers are prepared to solve it for you. Extensive experience in solving these noise problems in the locomotive and marine fields, municipal and industrial power plants, sewage disposal plants, and water works is at your service. Our broad line of Snubbers permits us to recommend the most suitable unit for your particular application. Consult Burgess-Manning Engineers, today.



Burgess-Manning Intake Filter Snubber and Exhaust Snubber installed on a Fairbanks-Morse Diesel in the Municipal Power Plant at Sullivan, Illinois. There is a Burgess-Manning Snubber for every engine exhaust and compressor noise problem.

A Burgess-Manning Snubber for effectively reducing engine exhaust and compressor intake noises.

BURGESS-MANNING COMPANY

749-J East Park Ave.

Dallas LIBERTYVILLE, ILLINOIS Chicago

Indianapolis Power & Light Installing

FIVE I-R RECTANGULAR CONDENSERS

at fast-growing White River Station

OTHER I-R EQUIPMENT
in the Station
Boiler-feed pumps
Condensate pumps
Circulating-water pumps
plus many
smaller pumps

When the fifth turbo-generator goes on line, as scheduled for December 1953, the Indianapolis Power & Light Company's White River Station will have increased its capacity from 90,000 kw to 271,000 kw in less than four years. *All five* turbines in this station will be served by *complete Ingersoll-Rand condensing plants*—Rectangular Condensers, steam-jet ejectors, condensate pumps and circulating-water pumps. Gibbs & Hill, Inc. are the consulting engineers on this fast-growing White River Station.

The first two I-R Rectangular Condensers, each containing 30,000 sq ft of condensing surface, were installed in 1949 and 1950 to serve two 45,000 kw turbo-generators. The third condenser, now being installed, is identical and will serve a duplicate 45,000 kw turbine.

It was originally planned to add another 45,000 kw unit. But, because of the increased power demand, the fourth turbo-generator will have a capacity of 68,000 kw . . . due on line in 1952. It will be served by a 40,000 sq ft I-R Rectangular Condenser with complete I-R auxiliaries.

Unit No. 5, to be installed in 1953, will be another 68,000 kw machine, with a duplicate I-R 40,000 sq ft condensing unit. In addition, Ingersoll-Rand boiler-feed pumps and a host of smaller I-R pumps will be serving right along with all the condensing equipment.

Ingersoll-Rand Rectangular Condensers, like these five, save space and installation costs, because the rectangular shell is designed to *fit* the rectangular space available under the turbine. They are completely factory assembled and shipped *in one piece* or *in flanged sections* that can be bolted together without field fitting or strength welding.

Your nearest I-R representative will gladly discuss this and other new developments in the power field with you.

Ingersoll-Rand

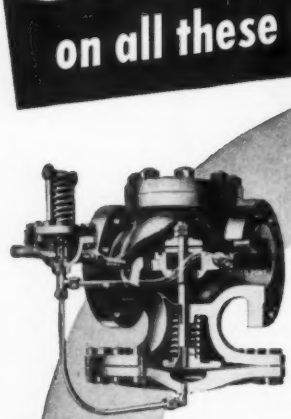
11 BROADWAY, NEW YORK 4, N. Y. 728-4

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

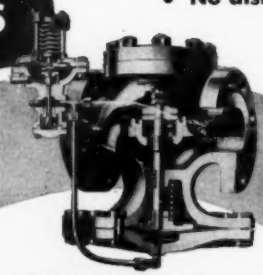
SAVE WITH SPENCE on all these jobs

Here are a few reasons why Spence Regulators give you accurate regulation and long, trouble-free life:

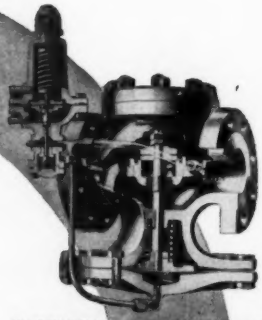
- **Single-seat Packless Construction**
- **Large Balanced Metal Diaphragm**
- **Sensitive Pilots**
- **SECO Metal Seats and Discs**
- **Springs out of path of steam**
- **No dismantling for inspection**



BACK PRESSURE CONTROL—Wide selection of sensitive pilots to meet exacting requirements. Initial pressure closing, guaranteed to shut tight. Packless construction, metal diaphragms.

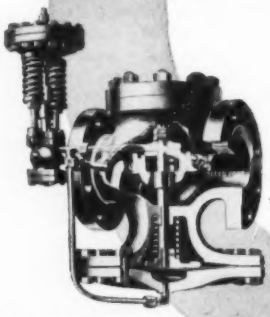


PRESSURE REDUCING—Self-operated, dead-end regulators powered by large, frictionless, metal diaphragms. Sizes ¼ in. to 12 in. Pressures to 600 psi 750 F.

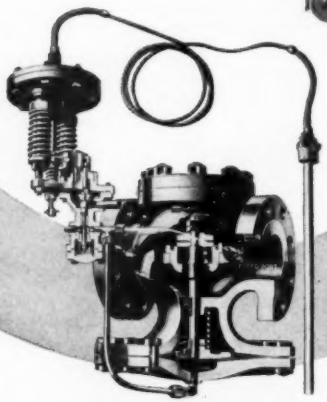


DIFFERENTIAL PRESSURE—Accurate control of delivery pressure at a constant, adjustable differential from 3 to 150 psi above another source of fluid pressure.

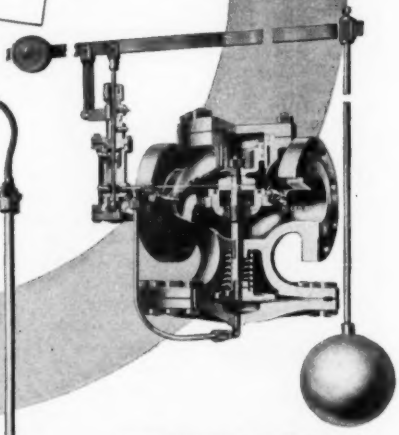
WRITE FOR BULLETIN 350
for complete details on Spence's line of automatic regulating valves



PUMP GOVERNOR—Constant or excess pressure control for steam pumps. Steam pressures to 600 psi 750 F, pump discharge pressures to 2000 psi.



TEMPERATURE REGULATING—Combined temperature and pressure control. No separate reducing valve required. Shuts tight, will not wiredraw or be damaged by overheating. Sizes to 12 in.



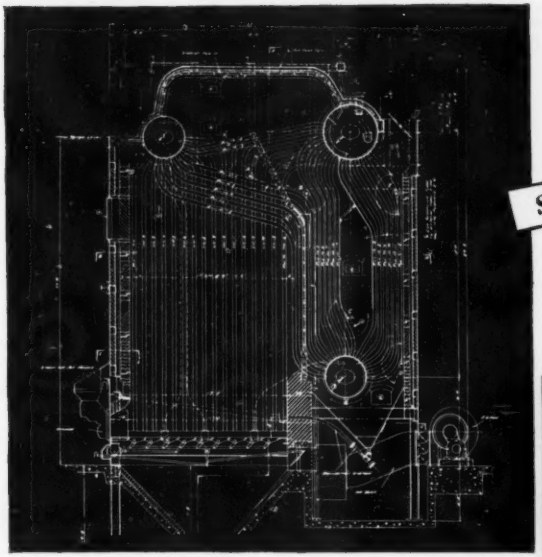
LEVER OPERATED—Pilot lever for connection by cable or mechanical linkage to floats or other devices. Slight actuator motion opens and closes main valve.

GE-113

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence

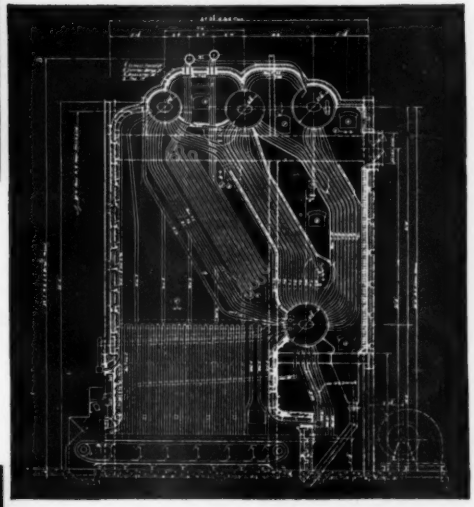
Quick Steaming at all Ratings!



Carry high overloads with high efficiency

SPECIFY Vogt

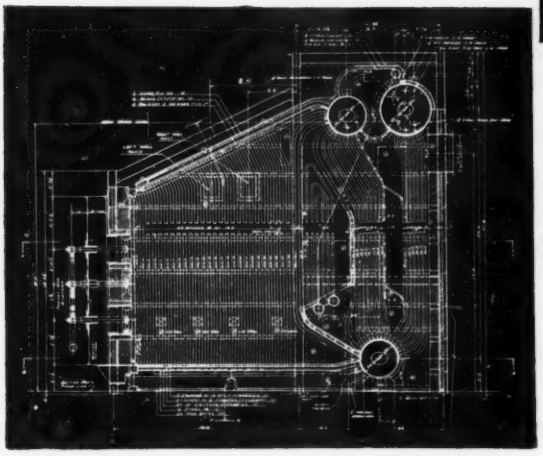
STEAM GENERATING UNITS



CLASS VL Two 27,500 pounds per hour units, installed at Brown-Forman Distillers Corporation, Louisville, Ky. Features large furnace volume in limited space, with high ratio of radiant heating surface.

CLASS LE Mt. Carmel Public Utility, Mt. Carmel, Illinois, is served by this 60,000 pounds per hour unit. Generous steam liberating surfaces and steam space permit wide fluctuations in load.

CLASS VR 70,000 pounds per hour steam generator at Humble Oil and Refining Company, Johnsue, Texas. An efficient, high-duty unit with water cooled furnace, using refinery gas fuel.



Vogt builds a complete line of bent tube steam generators, designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Superheaters, air preheaters, economizers, water walls, and soot blowers can be readily incorporated. Bulletins with general information and showing typical installations are available upon request.

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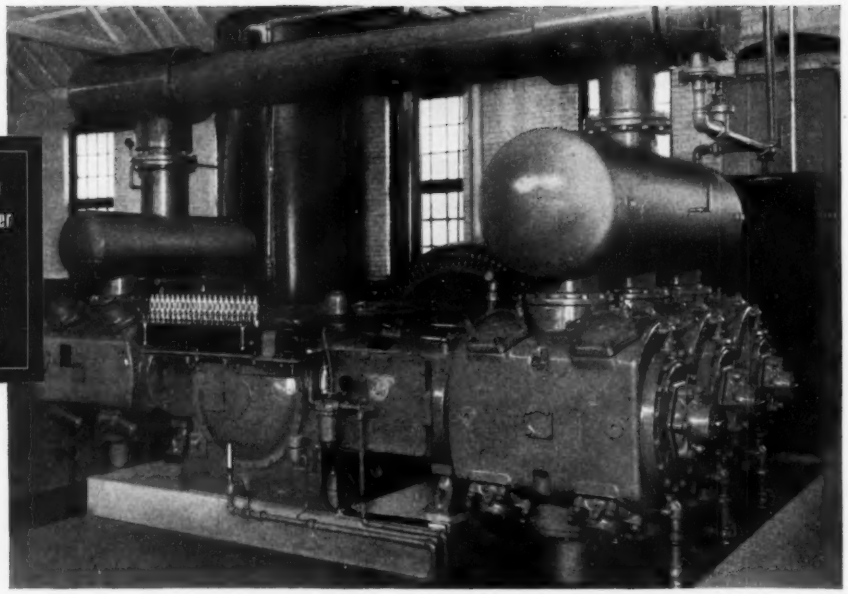

Recently installed in Newark Stove Company plant, Newark, Ohio, this is a Cooper-Bessemer 800 hp Type FM compressor with 5 balanced-opposed compressor cylinders.

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For example, with balanced, opposed action, it's the smoothest running compressor money can buy . . . and that means continuous, vibration-free operation with less repair, less maintenance.

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But check up further. Look into the many construction features, found only in Cooper-Bessemers, that are your *best* guarantee of permanent satisfaction.

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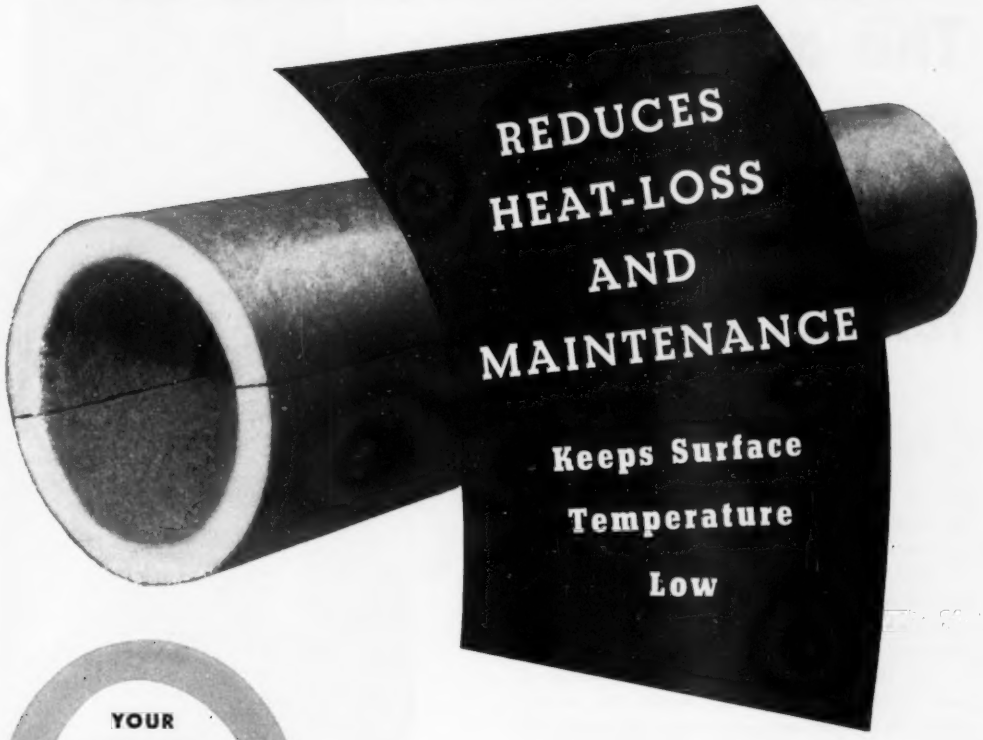

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P-10

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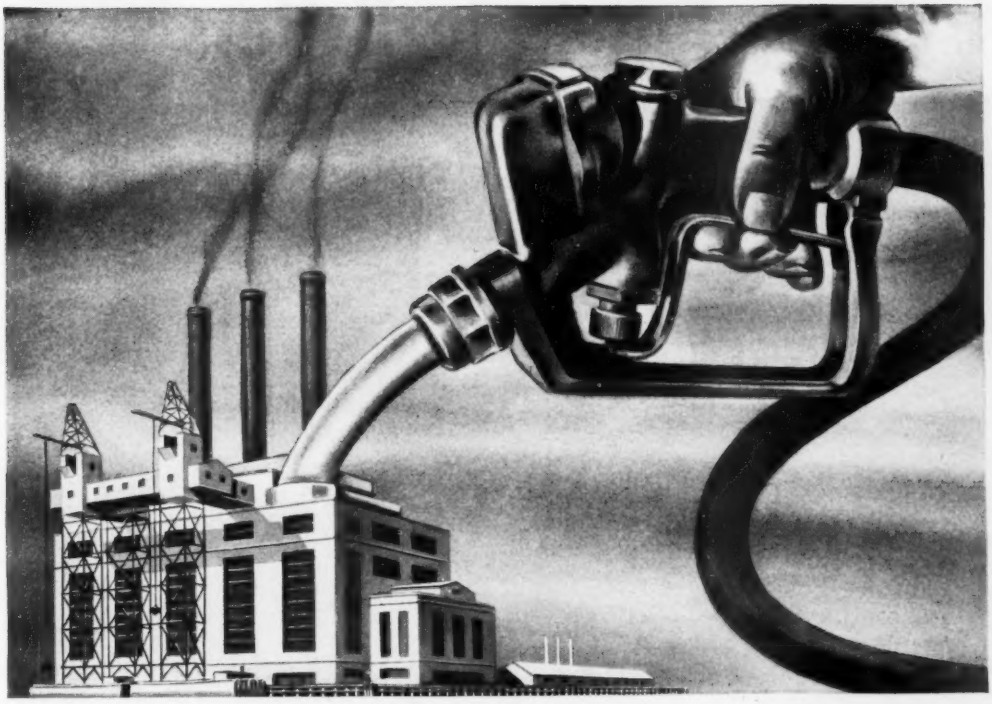

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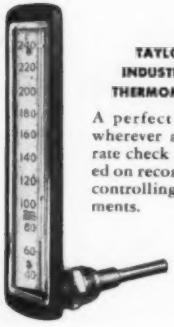

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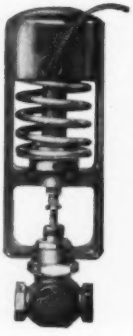

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Fig. 559—125-pound Iron Body Bronze Mounted Swing Check Valve with flanged ends, bolted flanged cap and regrindable, renewable bronze seat and disc. Disc, when wide open, permits full, unobstructed flow through valve body.

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So, no matter what your requirements may be, Powell can supply the right valves to meet them.

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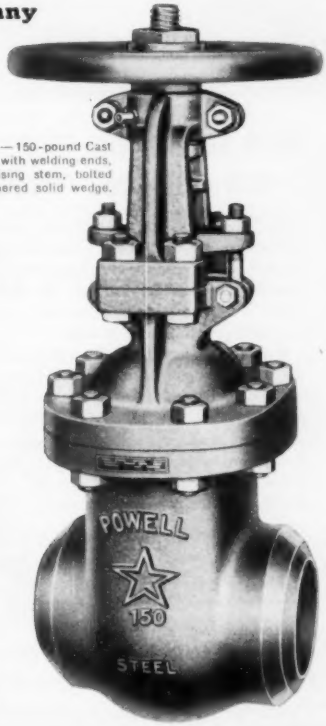

Fig. 1503 W. E.—150-pound Cast Steel Gate Valve with welding ends, outside screw rising stem, bolted flanged yoke, tapered solid wedge.

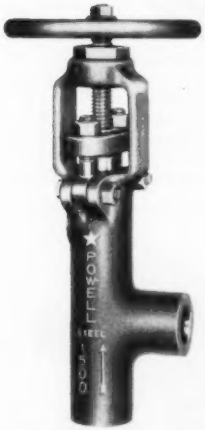

Fig. 1333-A—Steel Integral Bonnet Angle Valve for 1500 pounds W. P. Socket weld ends. Sizes ¼" to 2", incl.

Fig. 375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable wear-resisting "Powellium" nickel-bronze disc.

Fig. 1331-A—Steel Integral Bonnet Offset Globe Valve with socket weld ends. For 1500 pounds W.P. Sizes ¼" to 2", inclusive.

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1. *Locate pump as close as possible to water supply* to keep suction line short and direct. Give your pump the best chance for peak performance.

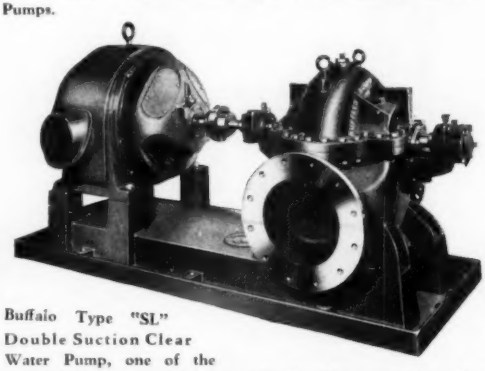
2. *Keep friction losses at a minimum* by keeping fittings to a minimum and suction pipe larger than the suction opening of the pump.

3. *Avoid air locking in suction line.* Be sure suction line has no "humps" or "hollows" where air pockets might form.

4. *Maintain shaft alignment.* Pump foundation should be sturdy enough to avoid sagging, which causes misalignment. When installing pump, check alignment with feeler gauge between impeller and clearance ring to be sure clearance is the same at all points. Poor alignment results in excessive coupling and bearing wear, and lowered efficiency.

Be Sure The Pump Is Right, Too ...Specify "Buffalo"

Since the installation can be no better than the pump, it is important to pick one of known quality. "Buffalo" Pumps are giving satisfaction in every industry, handling every type of liquid from clear water to paper stocks. They are known for their high efficiency, their simple maintenance, their long life on the job. Specify "Buffalo" and be sure of the results you want. Below is one of many types of dependable "Buffalo" Pumps.



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SANTA CLAUS

Could Die of Old Age

No one shoots Santa Claus. This remark about a government which spends and spends and spends may well be true. But it is also true that Santa Claus is an old man. At his age overwork might well kill him.

It is with the possibility of working Santa Claus to death that this editorial is concerned. No position is taken as between the contending political parties in the present campaign. Our concern is with the problem of protecting Santa Claus.

It is true that as a nation we now enjoy great prosperity. The prosperity is not nearly so general as the political advertisements of it would suggest. Millions of individuals, notably those living on pensions, annuities and other fixed incomes, have been robbed of half their purchasing power by inflation during recent years, and whole industries know little or nothing of boom times.

However, measured by so basic a gauge as unemployment, we do have great prosperity. Less than two million of our total working force of over 64 million are unemployed, and many of them are unemployed only while moving from one job to another. The real income, i.e., what their dollars will buy, of those with jobs is somewhere near its all-time peak.

Our Prosperity is Precarious

The prosperity we enjoy, however, is precarious. This is primarily because it is dependent upon a rising volume of expenditures by the federal government. At present almost a quarter of our entire national income is ladled out through Washington, and in an ever increasing amount.

If, as matters now stand, federal expenditures were to be suddenly and sharply cut, our government-financed prosperity would be severely upset. But if the federal government were to try to keep right on providing prosperity by steadily increasing its expenditures, the end result would be more certainly disastrous. It would be a crash caused primarily by having continuing inflation of prices destroy the value of the dollar.

Higher government expenditures of worthless dollars then could accomplish nothing. Santa Claus would be dead from overwork.

To Provide Firm Foundations

The general route to be followed in putting firm foundations under our prosperity is quite clear. It involves two steps which must be taken closely together. The first is to stop the continuous increase in federal expenditures. The second step is to substitute expanding private business for government-financed business as the principal foundation of expanding prosperity.

The increase in federal expenditures can be stopped without sacrificing any effective measures now directed toward meeting our top priority requirement—protection from armed Communist aggression. The most competent authorities of both major parties agree it can be done by (1) better planning of and the elimination of outright waste in defense arrangements, and (2) cutting those civilian expenditures which cannot be justified at the same time we are undertaking a great new load of defense expenditure.

It is also possible to substitute expanding private business for government-financed business. The problem is primarily that of relieving private business of the staggering load of federal taxation it now is carrying. Federal taxation now takes 52 per cent of all corporate profits and 82 per cent of all so-called excess profits. If it were not for the forced draft placed under our economy by rapidly mounting defense expenditures, this burden would surely lay a disastrous blight on private business expansion. If expanding private business is to have a chance to play its critical role as a substitute for government-financed business, its taxes must be cut, and soon.

It Won't be Easy

It would be naive to contend that it will be easy to check the expansion of federal expenditures. They have been running wild too long, and in the process contributing to a feverish, inflationary prosperity. Likewise, there is no reason to believe that the easing of the load of business taxes is going to be easy. The basic blight it puts on business expansion has been too long obscured by having our economy dosed with artificial stimulants, most notably enormous injections of federal expenditures.

The Key Question—How Long?

It is obvious that prosperity is going to be a major topic of discussion in the present political campaign. There is nothing the matter with that. Prosperity is a key concern of the voters in choosing a national administration.

To make the discussion of prosperity really useful, however, it is important to ask and get answers to the right questions about it. The key question is not whether or not we have prosperity. That we have it in large measure is generally conceded.

The key question is, "How long can we continue to have prosperity?" The answer—not very long if we continue to rely primarily on new injections of inflationary federal expenditures. Santa Claus, be it remembered, is no youngster. If we continue our present improvident course, he will be worked to death. Those politicians, regardless of party, who see this clear danger and who have plans to escape it are facing up to the crucial question about our prosperity.

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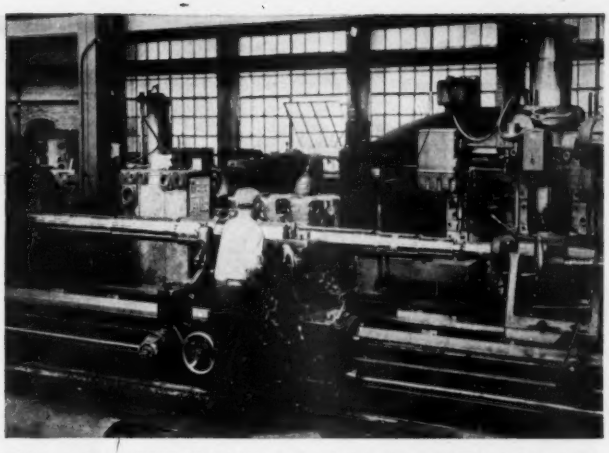

This is the largest INCO Nickel Alloy pump shaft in the world. The shaft is 13 feet 7⅛ inches long, 9.005 inches at its widest diameter, and weighs 3,343 lbs. It was forged by INCO'S Huntington Mill from "K" Monel for Consolidated Edison Co., after other materials repeatedly failed. Neither "K" Monel nor Monel have ever been known to fail from corrosion fatigue in salt water.

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"K" Monel is a tough, corrosion-resisting wrought alloy of Nickel, copper and aluminum. It offers you the excellent corrosion resistance of regular Monel, together with the added advantages of greater stiffness and hardness through heat treating.

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New York City's Consolidated Edison Company has two big 80,000-gallon-per-minute condenser circulating water pumps. For years engineers kept replacing the shafts with materials of increasing strength but failures would continue to occur in the same spot because of corrosion fatigue.

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A 1½-ton heat-treated "K" Monel shaft with a tensile strength of 140,000 pounds per square inch was installed in September of 1949 and has been functioning perfectly ever since. In fact, the pump casing has not even been opened for inspection since installation.

Let's take a quick look at a few of the principal characteristics of "K" Monel:

Age-hardenable, or capable of having its hardness and mechanical properties increased simultaneously as the result of thermal treatment, "K" Monel is equal in strength and toughness to many heat-treated alloy steels. It shows improved strength and hardness at sub-zero temperatures with no loss of toughness. And it provides moderate strength at temperatures up to 900° F.

"K" Monel is non-magnetic under ordinary conditions, and remains so down to −150° F.

The working characteristics of "K" Monel are excellent, too. It is readily machined in an annealed condition, but in other conditions may be considered commercially machinable at practical (although generally somewhat slower) rates. It can be joined by the usual welding, brazing and soldering processes.

You'll find all essential engineering data on "K" Monel and its more machinable companion alloy, "KR" Monel, in the 24-page reference manual, "Engineering Properties of 'K' Monel and 'KR' Monel." Write for your copy.

One last—and important—point. "K" Monel, like other INCO Nickel Alloys, is now on extended delivery because of defense needs. So it is important to include NPA rating and complete end-use information with all orders.

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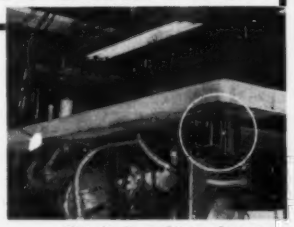

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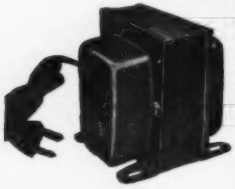

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28 PAGES
of helpful facts to know about
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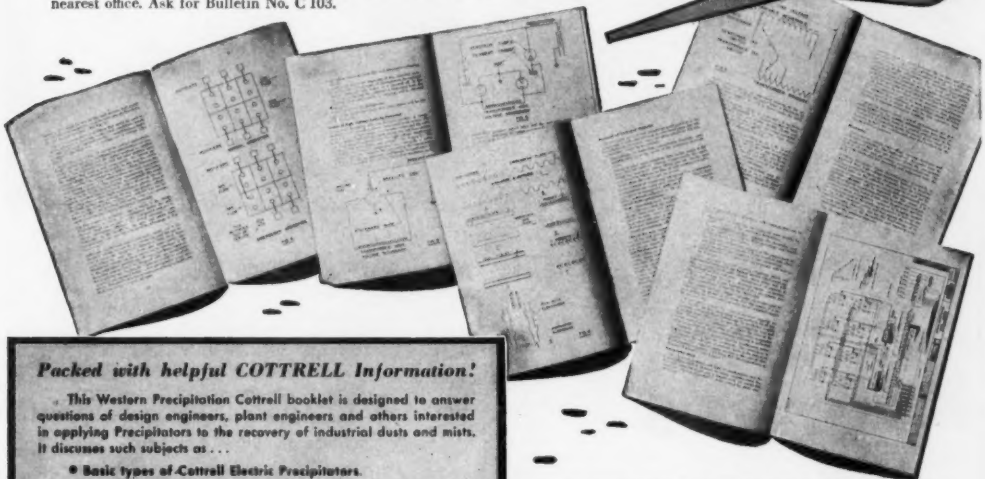

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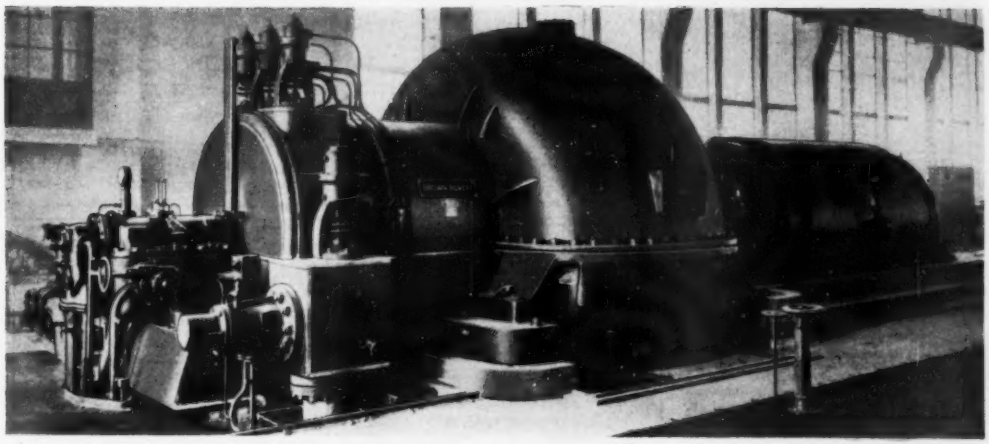

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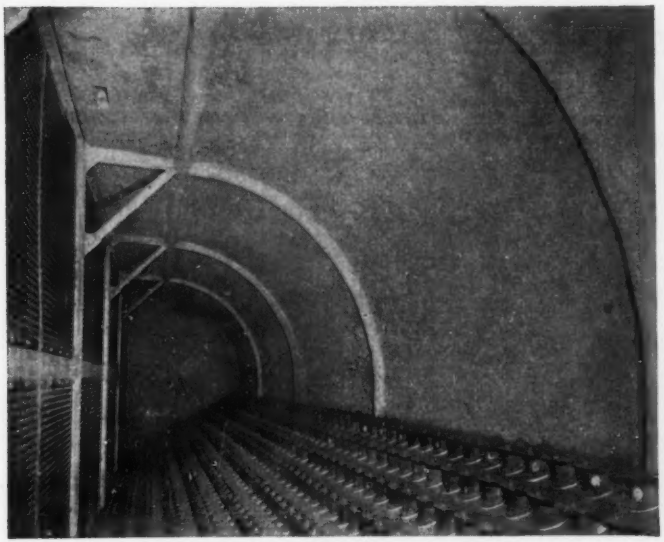

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P-L-70

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500	*G.E.	PGB	3600
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400	*Continental	NZ	1200
400	A.C.	ANW	900
400	*G.E.	IK	514
350	*Cr.-Wh.	SC	3600
300	*Westgh.	CS	3600
300	G.E.	IE-K	1200
300	A.C.	AR	900
250	A.C.	630DSWW	1200
250	*L. Allis	0GX1488	720
250	G.E.	IK	600
200	*G.E.	FT549Y	3600
200	*G.E.	IK13B	1800
200	A.C.	ARWWT	600
200	G.E.	IK17	600
150	G.E.	KT346	1800
150	*A.C.	AN	1890
150	G.E.	IE-K	1800
150	F.-Morse	H	900
150	*G.E.	IK	600
125	*A.C.	AR226	1800
100	*G.E.	FT542Z	1800
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100	A.C.	AW	1200
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300	*G.E.	IM-15	1800
300	*G.E.	MT-410	450
250	Westgh.	HP15H	600
200	G.E.	IM	1800
150	Westgh.	CW772C	1200
150	*G.E.	IM-16	600
125	*G.E.	MT-349	1800
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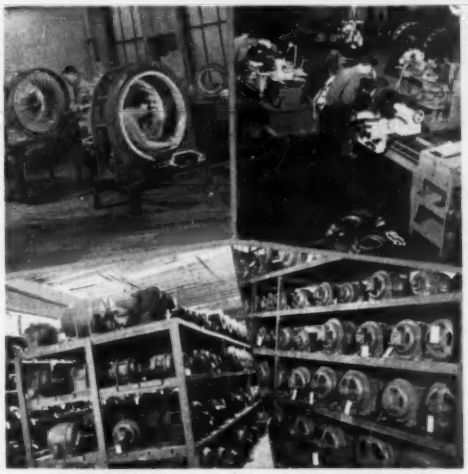
50	G.E.	MT346	720
50	G.E.	IM	600
50	G.E.	IM14	450

SPECIAL

110 NEW Hi-Torque—Hi-Slip Motors 3/60/220/440, BB, Straight Shaft 1 — 1½ — 2 — 3 — 5 — 7½ HP. Speeds —1020 to 1135 RPM. OPEN and TENV.

Less than HALF of your instal Cost



AC SYNCHRONOUS

MOTORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2200 Volts or Higher)

H.P.	Make	Type	R.F.	Speed
1420	*Westgh.		0.7	900
800	G. E.	TS984	1.0	1800
700	G.E.	TS975Z	1.0	514
320	*A. C.		1.0	720
300	G. E.	ATI	0.8	900
300	*G. E.	ATI	1.0	720
300	Ideal	SNS	1.0	257
250	*A. C.		0.8	720
150	*Westgh.	HR	1.0	300
125	Parkinson			900
125	*El. Ma.		1.0	900
125	Cr.-Wh.	103S	1.0	900
125	*G. E.	TS	1.0	277
115	El. Ma.	EM	1.0	240
100	Cr.-Wh.	103S	0.8	900
100	*G.E.	ATB	0.8	900
100	Ideal	SNS	1.0	900
75	G.E.	ATI	1.0	900
40	G.E.	ATB	0.8	1200
20	Fynn-W.	15 VRN		1200
15	Ideal			1800
15	Century	ARC365	1.0	1200
7½	Ideal			1800

AC SYNCHRONOUS

GENERATORS

3 Phase, 60 Cycle, 220 or 440 Volts (*2200 Volts or Higher)

KVA	Make	Type	P.F.	Speed
3500	*G. E.		0.8	720
1750	*Westgh.		0.7	900
1500	G. E.	ATI	0.8	720
250	*A. C.		0.8	720
112½	*G. E.	ATB	0.8	1200
110	Cr.-Wh.	103	0.8	900
100	*G. E.	ATB	0.8	900
60	F-M	B	0.8	900
55	G. E.	ATB	0.8	1200
50	G.E.	ATB	0.8	1200

D. C. MOTORS

Mill Type—Pedestal Bearing—Reversing

HP	Make	Volts	Speed
1000	West. (Tandem)	525	600
1750	West.	600	550
1500	West.	525	600
1200	West.	525	600
1000	West.	450	600

230 Volts—Constant Speed

H.P.	Make	Type	Speed
375	Westgh.	Ped	650
200	Westgh.	SK210	800
175	G. E.	ELC	750
125	G. E.	Marine	1200
100	G. E.	RC34	2500
100	A. C.	E182	575
100	G.E.	ELC	750
75	G.E.	MDS106	485
50	G.E.	RC35	700
40	Cr.-Wh.	CMC	1750
40	G. E.	CO2004	600
35	Cr.-Wh.	CM351	700
30	Westgh.	SK90	1750
30	Westgh.	SK120	975
30	Cr.-Wh.	CCM	440
25	G. E.	CD93	1200
25	Westgh.	SK100L	1100

MANY OTHERS—1 HP and Up!

Also 115 Volt

ENGINE-GENERATOR SETS

KVA	Make	Type	Volts	RPM
300	Gen. Mot.	8-268A	480	1200
100	Gen. Mot.	3-268A	480	1200
100	Gen. Mot.	6-71RC	480	1200
81	Cummins	HI-6	120/208	1200
25	LeRoi	20-A	120	900
1½	Kohler	D-7551	110 DC	1000

PHONE: CANAL 6-2900

CHICAGO Electric Co.

1320 West Cermak Road, Chicago 8, Ill.

MODERN PLANT, LATE-TYPE MACHINES AND EXPERT WORKMEN OUTSTANDING COMBINATION

CHICAGO ELECTRIC's plant is modern in every sense of the word . . . it is fully equipped with the latest type machines and testing equipment . . . it is staffed with competent and experienced workmen. This combination of machines and men has provided users of electrical power equipment with a guaranteed and outstanding service for over 42 years.

COMPLETE STOCKS ON HAND

CHICAGO ELECTRIC's modern plant also houses one of the nation's largest stocks of guaranteed rebuilt power equipment . . . AC & DC MOTORS, M. G. SETS, GENERATORS, CONVERTERS, COMPRESSORS, HOISTS, PUMPS, TRANSFORMERS, CONTROLS and other allied equipment. The columns of the *Chicago Electric Digest* carry only a partial listing of this tremendous stock . . . so, whatever you need and whenever you need it . . . be sure to check with CHICAGO ELECTRIC first!

M. G. SETS

K.W.	Make	A.C.	D.C.
2400	A-C (3-unit)	4800	826
2400	West. (2-unit)	4800	600
1000	G. E. (3-unit)	11000	187½/275
1000	West.(3-unit)	11000	187½/275
500	Al. Ch.	2300	250
500	Cr.-Wh.	220/440	250
450	G. E. (3 unit)	2300	125/250
250	West.-G. E.	440	250
200	Ridgeway	2200	250
150	G. E.	2300/440	250
150	G. E.	440	275
100	G. E. (25 cy)	440	125
100	G. E.	2300	250
100	G. E. Delco	440	120/240
75	Al. Ch.	440	250
60	Al. Ch.	2300	110
40	A. C.	220	125
40	Cr.-Wh.	220	125
35	G. E.	440	125
25	Westgh.	2300	125
20	G. E.	440	125
20	G.E.-Bogue	440/550	250
20	G. E.	220/440	250
20	G.E.-Bogue-	220/440	125

DC to AC

100	G.E.	235	230
75	Westgh	110	2300
12½	Westgh	115	240

TRANSFORMERS

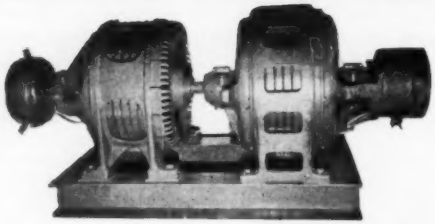
KVA	Make	Ph.	Prl.	Secondary
1000	Westgh.	3	4800	480
850	Westgh.	3	4160	455
450	G.E.	3	2300/4000	230/460
300	G.E.	3	13800	240/480
300	G.E.	3	2400	240/480
200	Wagner	1	2400	575
167	A.C.	1	2400	120/240
100	Pitts.	1	2400	575
100	A.C.	1	2400	120/240
50	Sorgel	1	2400	120/240

HI-PRESSURE

PUMPS

GPM	Make	Type	Head
800	Worth	6DS	925 ft.
500	Maniatee	H	250 ft.
300	Al.-Ch.	NMZ	900 ft.

WAGNER
CERTIFIED REBUILT



"Check with WAGNER FIRST"

Complete shop facilities—Dynamic Balancing—Dynamometer Testing—plus a large selection of fine equipment—these are among the many advantages when you buy Wagner "Certified Rebuilt". Save Time & Money Safely!

PARTIAL LISTING OF LARGER ITEMS IN STOCK

A. C. MOTORS

H.P.	Mfr.	Type	Volts	Speed
750	Whse.	Synch.	2200/4000	900
700	G.E.	Synch.	2200	514
500	G.E.	Sq. Cage	6600/4000	1800
500	G.E.	Sq. Cage	440	3600
500	G.E.	Synch.	440	900
500	G.E.	Slipring	220/440	450
500	Al. Ch.	Synch.	440	400
450	Whse.	Synch.	2300	900
350	G.E.	Slipring	440	720
300	G.E. New	Slipring	2300/440	720
300	El. Mach.	Synch.	2200/440	360
300	G.E.	Sq. Cage	220/440	1200
300	G.E.	Sq. Cage	2300	1800
300	Whse.	Synch.	2200/440	600
300	G.E.	Slipring	2300	1800
300	Al. Ch.	Slipring	440	360
250	Whse.	Sq. Cage	2200/440	1200
250	G.E.	Sq. Cage	440	600
250	L.A. (3)	Sq. Cage	2200	1800
225	E.M.	Synch.	440	1800
225	G.E.	Synch.	220/440	600
200	G.E. TEFC	Slipring	220/440	1200
200	Al. Ch.	Synch.	440	360
200	G.E.	Slipring	220/440	360
200	Cr. Wh.	Slipring	220/440	600
200	G.E.	Sq. Cage	220/440	1800
200	Rel. b.b.	Sq. Cage	220/440	1200
200	E.M.	Synch.	220/440	514
160	Whse.	Synch.	220/440	600
150	G.E. TEFC	Sq. Cage	220/440	1200
150	G.E.	Slipring	220/440	600
150	Rel. b.b.	Sq. Cage	220/440	1200
150	Al. Ch.	Slipring	2200/440	720
150	G.E.	Sq. Cage	2200/440	720
150	G.E.	Slipring	220/440	450

A. C. GENERATORS — 60 CYCLE

KVA	Mfr.	Type	Volts	Speed
1000	Whse. syn. cond.		4000/2300	900
625	Gen. Elec.	ATB	2300	450
625	G.E. 25 cycle	ATB	2300	750
600	Gen. Elec.	ATB	480	900
500	El. Machy.		240/480	1200
500	Gen. Elec.	ATB	480	900
485	Allis. Ch.	1 brg.	480	400
350	El. Machy.	1 phase	240/480	1200
312	Gen. Elec.	ATB	240/480	600
275	G.E. 25 cycle	ATI	480	750
250	Whse.	G	2400/480	600
225	Gen. Elec.	ATB	240/480	600
150	Whse.		2300/480	600
125	Gen. Elec. (2)	ATB	240/480	900
112	Gen. Elec.	ATB	240/480	900
75	El. Machy.		2300	900

M-G SETS

KW	Mfr.	Input V	Output V
500	Whse.*	2300 AC	250 DC
300	Allis Ch.	2200/440 AC	125/250 DC
300	Whse.*	2300 AC	600 DC
250	Allis Ch.	440 AC	350 DC
200	Whse.*	2300 AC	275 DC
200	Gen. Elec.*	220/440 AC	125 DC
150	Whse.*	220/440 AC	125/250 DC
105	Century b.b.	220/440 AC	70 DC
100	G.E.	220/440 AC	125 DC
100	Delco b.b.	220/440 AC	125/250 DC
100	Allis Ch.*	220/440 AC	50 DC
75	Diehl b.b.	220/440 AC	300 DC
60	Gen. Elec.*	220/440 AC	60 DC
50	Gen. Elec.	220/440 AC	125 DC
50	Allis Ch. (2)	220/440 AC	125/250 DC
45	Gen. Elec.*	220/440 AC	60 DC
40	Whse.	220/440 AC	125 DC
40	Gen. Elec.	220/440 AC	250 DC
35	C.W. b.b.	220/440 AC	125 DC
25	Whse.	220/440 AC	125 DC
25	Reliance b.b.	220/440 AC	250 DC
20	Whse.	220/440 AC	600 DC
21	Whse.	220/440 AC	35 DC
17	Gen. Elec.	220/440 AC	125 DC

D. C. GENERATORS

KW	Mfr.	Type	Volts	Speed
300	Whse.	SK	600	900
250	Allis Ch. b.b.	EW	250	1200
150	Whse.	SK191	125/250	900
125	Gen. Elec.	RC38	250	675
105	Century b.b.	1500 amp.	70	1200
100	Whse.	SK	250	900
100	Allis Ch.	E	125	1200
60	Cont. b.b.	D	250	1500
60	Gen. Elec.	LC	250	700
50	Allis Ch. (2)	EW	125/250	1200
40	Gen. Elec.	RC	250	1150
25	G.E. b.b. New	CDM93	125	1500

D. C. MOTORS

HP	Mfr.	Type	Volts	Speed
300	Allis Ch. b.b.	EW	250	1000
300	Gen. Elec.	MPC	230	500
200	Reliance	1400T	230	850
150	Reliance	1050T	230	1200
150	Gen. Elec.	RC39	230	550
150	Gen. Elec.	MPC	230	500/1200
100	Cr. Wh. b.b.	JH	115	1150
100/240	Diehl b.b.	K10	240/600	1000/2400
75	Whse.	SK	230	450/900
60/75	Gen. Elec.	C	230	500/1200
60	Cont. b.b.	D107X	230	1150
50	Gen. Elec.	CD123	230	550/1200
50	Al. Ch. (2)	E-131	230	1150

QUICK SHIPMENT FROM STOCK — LOW PRICES — FULL GUARANTEE

Send for Complete Stock Lists

Arthur Wagner Co.

1435 W. RANDOLPH ST. MOnroe 6-7405 CHICAGO 7, ILLINOIS

43rd YEAR —:— 43rd YEAR
MOTORS & GENERATORS, etc.
1 YEAR GUARANTEE

Partial Listing Only!

GENERATORS—250 V. D.C.

KW	Make	Type	Speed
500	G.E.	MPC	900
300 (2)	G.E.	CT-271	1200
300	Elliott		1500
250	Cr. Wh.	Syn.	1200
200	Delco		1200
150	West.	SK	900
125 (2)	G.E.	MPC	1200
100	West.	SK	1200
75 (2)	Cr. Wh.		1200
50	West.	SK	900
40	West.	SK	1150
40	ABBese	SVG3	1150
30	G.E.	TC93-4	1800
25	G.E.	RC	1150
20	Watton	D	1150
15	Star		1750
10	G.E.	RC	1150
7½	West.	SK	1750

GENERATORS—125 V. D.C.

KW	Make	Type	Speed
150 (2)	West.	SK	1200
100	El. Mchy.	651-T	1200
100	G.E.	RC	1200
100 (3)	West.	SK	900
100	G.E.	MPC	900
75	G.E.	DLC	1150
60 (2)	West.	SK	1800
50	G.E.	RC	1150
50	Cr. Wh.	CCD	1160

LOW VOLTAGE D.C.

Amp.	Make	Voltage
10000	J-L	2/10
7500 (2)	Nor.	7½
5000	HVW	6
2500	Chandev.	6/12
500	Chandev.	12
1500	Century	24
500	West.	32
1000	Century	32
1000	Chandev.	40
1500	Century	40
1500	G.E.	50
1000	G.E.	60
1000	G.E.	75

JUST PURCHASED

350—230v. D.C. Motors

Over 6200 Total H.P.

G.E.—WEST.—RELIANCE, etc.

Speeds 500 to 1750 RPM

2—150 HP	6—40 HP	75—10 HP
1—125 HP	2—30 HP	78—7½ HP
12—100 HP	1—25 HP	21—5 HP
10—75 HP	29—20 HP	22—2 HP
2—60 HP	55—15 HP	31—1 & 1¼ HP

MOTORS—Squirrel Cage

H.P.	Make	Type	Speed
250	G.E.	KT359	1750
200	Wagner	RP-2	1800
200	G.E.	KP	880
200 (2)	Al. Ch.	AR	870
200	G.E.	KG	700
150	Wagner	31VRN	900
150	West.	CS	600
125	Al. Ch. (5)	AR	1750
125	G.E.	IK	1150
100	G.E.	KT	1800
100	G.E.	IK	1750
100	West.	CS	1750
100 (2)	Al. Ch.	AR	1150
100	G.E.	K	1175
100	West.		870
75 (2)	West.	CS	1750
75	G.E.	KT	900
75	West.	CS	720

MOTORS—Slip Ring

H.P.	Make	Type	Speed
500	Elliott		1150
500 (2)	G.E.	IM	450
400	G.E.	IM	900
400	West.	CW	435
250	G.E.	IM	435
200 (2)	G.E.	IM	1170
200	G.E.	MT	1175
125	West.	CW	1750
100	G.E.	MT	1150
75	Lincoln		1750
75	G.E.	MT	900
75	West.	CW	690
60	G.E.	MT	1720
60	West.	CW	290

MOTORS—Synchronous

H.P.	Make	Speed
475	West.	720
200	G.E.	900
200 (2)	West.	900
200	Burke	900
180	G.E.	900
165	G.E.	1200
150	G.E.	900
150	G.E.	720
75	G.E.	900

Please Send Us Your Inquiries

L. J. LAND, Inc.

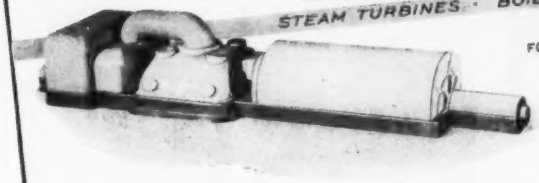
Established 1910

150 GRAND STREET, NEW YORK 13, N. Y.

CAnal 6-6976

Charles Weaver

STEAM TURBINES · BOILERS AND DIESEL ENGINES



FORTY-FIRST FLOOR, PENOBSCOT BUILDING
DETROIT 26, MICHIGAN
WOODWARD 1-1340, 1-1341, 1-6038
CABLE ADDRESS "CHASWEAVER"

October 15, 1952

Attention Industrials
Purchasing Agent
Manager
Chief Engineer
Manager of Production

Gentlemen:-

We invite your inquiries for good Turbo-Generators in sizes from 500-KW. to 15000 KW., steam pressures from 150 to 450-psig., condensing or non-condensing.
Write for FREE Stock Bulletin Today.
Investigation and correspondence invited.
Immediate Deliveries.

Very truly yours,

Charles Weaver

Charles Weaver

Also a Large Stock of Boilers, various capacities.

There's more than 40% to 60% SAVINGS on

SCHOONMAKER DEPENDABLE DIESEL POWER

because:

Each Schoonmaker-sold Diesel Engine Unit is fully REMANUFACTURED in our plants by highly skilled, factory-trained Diesel engineers. Only genuine factory-made and approved parts are used and all REMANUFACTURING is in strict accordance with manufacturer's recommended procedures. Prior to shipment every engine is subjected to a FULL LOAD operating test in accordance with DEMA standards.

The Schoonmaker Plants and Warehouses located in Jersey City, N. J. and Sausalito (San Francisco), California give NATIONWIDE SERVICE from Coast to Coast with modern, efficient and reliable facilities.

Our reputation and many years of experience and SPECIALIZATION in Diesel power equipment gives you value that money cannot buy elsewhere.

So—Buy SCHOONMAKER because you buy the FINEST in DEPENDABLE DIESEL POWER.

See our other advertisement on page 291 featuring Current Model G.M. DIESELS

A.G. SCHOONMAKER CO., INC.

50 CHURCH ST., NEW YORK 7, N. Y.

PLANTS AND WAREHOUSES:
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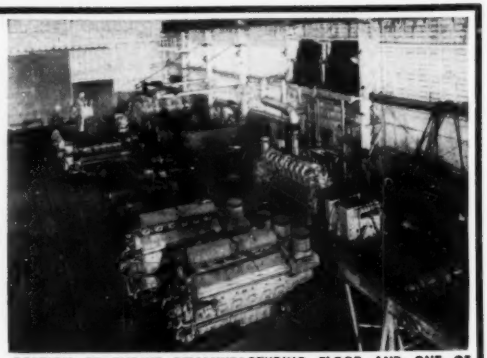
W. U. WIRE • CABLE — AGSCOMACH



PORTION OF ENGINE REMANUFACTURING FLOOR AND ONE OF THE ENGINE TEST STANDS AT OUR SAUSALITO, CALIF. PLANT.

A PARTIAL LIST OF OUR INVENTORY

KW	MAKE	MODEL	HP	RPM
1500	Fairbanks Morse	33E16	2000	300
1136	Fairbanks Morse	38D	1600	720
1100	General Motors	16-278A	1600	720
1000	General Motors	16-567B	1440	720
750	General Motors	12-567	1080	720
500	General Motors	8-278A	750	720
500	Baldwin	VO-8	750	514
500	General Motors	8-567	720	720
400	Ingersoll-Rand	S-8	600	720
350	Baldwin	VO-6	510	450
320	Buckeye	80	480	600
320	Enterprise	DSG-6	460	450
250	Fairbanks Morse	33-D	375	360
300	General Motors	8-268A	450	1200
200	General Motors	8-268A	350	900
167	Ingersoll-Rand	S	255	600
160	Buckeye	80	240	600
150	Worthington	CC-4	225	450
100	General Motors	3-268A	150	1200
100	Worthington	B8-5	150	600
60	General Motors	6-71	90	1200
30	Inter. Harvester	UD-14	45	1200

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STANDARD AND SPECIAL VOLTAGES AS REQUIRED

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Immediate Delivery in All Types of

BOILERS

Bought • Sold • Rented

We own and offer the following types of equipment now located at our warehouse:

1—50 H.P., 150 lb. Clayton Package Boiler
Erie City Economics—125, 170, and 200 H.P.
Fire Box Boilers—165 H.P.
Package Type Boilers—18, 30, and 100 H.P.
2 New Frederick Stokers—2500 lbs. of coal/hr.

BOILER & EQUIPMENT CO.

743 Bedford Ave. Brooklyn 5, N. Y.
ULster 5-3800

SPECIAL TRANSFORMERS — YOUR SPECIFICATIONS

NEW TRANSFORMERS
OIL COOLED
AIR COOLED
PHASE CHANGES

ARROW TRANSFORMER CO., INC.

1932 E. Westmoreland St., Philadelphia 34, Pa.
GArfield 5-0433

USED TRANSFORMERS
REWOUND
REBUILT
RECONDITIONED

MOTOR GENERATORS

1—500 KW G. E. Syn. 250 V. 900 RPM
1—400 KW G. E. Syn. 600 V. 720 RPM
2—300 KW WEST. Syn. 250 V. 1200 RPM
1—300 KW G. E. Syn. 250 V. 1200 RPM
1—300 KW RIDGWAY Syn. 250 V. 1200 RPM
1—240 KW G. E. Syn. 250 V. 1200 RPM
1—225 KW G. E. Syn. 125 V. 1200 RPM
1—200 KW G. E. Syn. 250 V. 1200 RPM
1—200 KW RIDGWAY Syn. 250 V. 900 RPM
1—150 KW G. E. Syn. 250 V. 1200 RPM
1—150 KW WEST. Syn. 250 V. 1200 RPM
1—100 KW RIDGWAY Syn. 250 V. 1200 RPM

ROTARY CONVERTERS

2—500 KW G. E. Syn. 25 8V. 1200 RPM
1—500 KW WEST. Syn. 250 V. 1200 RPM
1—300 KW G. E. Syn. 250 V. 1200 RPM
1—300 KW WEST. Syn. 250 V. 1200 RPM
2—200 KW AL-CH. Syn. 250 V. 1200 RPM
1—200 KW G. E. Syn. 250 V. 1200 RPM
1—150 KW G. E. Syn. 250 V. 1200 RPM
1—150 KW WEST. Syn. 250 V. 1200 RPM

WALLACE E. KIRK COMPANY
502 Grant Bldg., Pittsburgh 19, Pa.

BOILERS

10 to 5000 H.P.
Diesel, Steam Turbine, Engine

GENERATORS

Heavy Power Equipment
Industrial — Chemical Process Equipment

NEW – RECONDITIONED – USED

DEAN G. STRICKLER & ASSOCIATES
1346 Connecticut Avenue, N.W.
Washington 6, D. C. • DuPont 7366

RE-NU-BILT BELYEA MOTORS

THE TRADE MARK WITH A MEANING
SUCCESSFUL OPERATION GUARANTEED
44th YEAR OF SERVICE—MEMBER OF A.R.A.*

MOTOR GENERATOR SET
3 ph. 60 Cycle

Qu.	KW	Make	Speed	D.C. Volts	A.C. Volts
1	2000	G.E.	514	600	13800/4000
2	2000*	G.E.	500	600	6600/11000
3	1500	G.E.	514	250	13200
1	1500	G.E.	720	600	6600/13200
1	1500	Whse.	600	600	2300/4600
1	1500	G.E.	360	275	2200/4400
1	1500	G.E.	600	600	2700/4150
2	1000	Whse.	900	600	2300/4150
1	1000	G.E.	900	280	4600
1	1000(3U)	G.E.	900	250	2400/4800
2	750	Whse.	900	275	2300/4160
1	600	G.E.	720	250	440/2300
1	500	Whse.	900	125/250	440
1	500	Whse.	960	250	4600/13200
1	500	Whse.	1200	125/250	2300
1	500	G.E.	720	125	2300/4000
1	400	G.E.	720	250	440/2300
1	400	Whse.	1200	250	2300
1	350	G.E.	900	125	2300/4150
1	300	A.C.	1200	125/250	2300
1	150	G.E.	1200	250	2300
1	150	Whse.	1200	275	2300
1	150	G.E.	1175	125	440
1	140(3U)	Cr. Wh.	690	125/250	2300
1	125	G.E.	1200	125	440
1	100	Delco	1200	125/250	440
1	75	G.E.	1200	125	4600
1	75	G.E.	1200	250	440
1	40	Whse.	1200	250	220

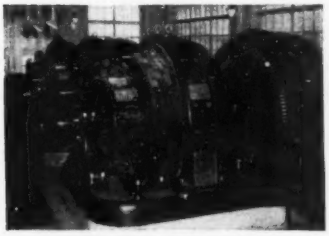
*25 Cycle

ROTARY CONVERTERS

1—2000	G.E.	514	600	13800
1—1000	Whse.	900	600	11000

TURBO GENERATORS

Qu.	KW	Make	Desc.
1	6000	Al. Ch.	Condensing 200/250 lbs. ISP 2500 3/60 Exc. & Surface Cond.
1	1000	Moore	Auto-Ext. Cond. 175/200# I.S.P. 20# G. Ext. Surface Condenser—3/60/2300.
2	1000	G.E.	Non-condensing, 175/200 lbs. I.S.P. 5/20 lbs. G.B.P., 480/3/60.
1	750	G.E.	Condensing 425#-725°TT. ISP. 440 V. 3 ph. 60 cy New—1944
1	500	Moore	Non-condensing — 150/200 lbs. ISP 5/35 lbs. G.B.P.—2/60/880 volts direct connected exciter.
2	500	G.E.	Non-condensing 175/200 lbs. I.S.P., 5/30 G.B.P., 480/3/60
1	400	Whse.	Non-condensing 125/150# ISP 5/10# G.B.P., 240/480v. 3 ph. 60 cy.
1	300	G.E.	Non-condensing 10/175# ISP 5/15# B.P. 480V. 3 ph. 60 cy.
1	200	Whse.	Non-condensing 150# ISP 7# B.P. 440 V. 3 ph. 60 cy.



3—1500 KW—250 V. D.C.—13200 V. A.C.
NOW AVAILABLE.

D.C. MOTORS

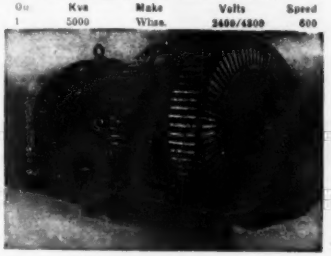
Qu.	HP	Make	Type	Volts	Speed
1—	2200	G.E.	MCF	600	360/500
1—	1750	West.		600	525/720
1—	1500	Whse.		525	600
1—	940	Whse.	QM-R Rg.	250	140/170
1—	800/1000	Whse.		450	600/720
1—	600	Al. Ch.	MILL	230	400/800
1—	500	Whse.	Mill	600	300/900
2—	450	Whse.		550	415
1—	400	G.E.	MCF	550	300/1050
1—	300/400	G.E.	DYNA	250	1323/2500
1—	250	Cr. Wh.	CCM-151H	230	1100
1—	235	Whse.	MG	250	300/900
1—	200/300	G.E.	MPC	230	360/920
1—	350	G.E.	MPC	230	400/500
1—	200	Rel.	1970T	230	720
1—	150	G.E.		600	250/750
10—	150	Cr. Wh.	SCH	230	800
1—	150	Cr. Wh.	CMC-151H	230	1150
1—	150	Whse.	SK-201	230	360/950
2—	150	Whse.	SK-151 R	230	900/1800
1—	50/120	G.E.	MPC	230	250/1000
2—	100	Whse.	SK-181	230	450/1000
2—	80	El. Dy.	308	230	475/1350
1—	60	El. Dy.	258L	230	750/1500

FREQUENCY CHANGERS

Qu.	KW	Make	Cycles	Voltage
1—3000		G.E.	25/60	4000/2300x2300/4000
1—2000		G.E.	25/62½	2300/4160
1—2000		Whse.	25/62½	2300/2300
1—1000		G.E.	25/58	4400/2300
1— 500		A.C.	25/60	11000/2300V

SYNCHRONOUS CONDENSERS

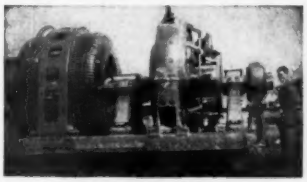
Qu	Kva	Make	Volts	Speed
1	5000	Whse.	2400/4800	600



500 KW MG SET
IN STOCK

TRANSFORMERS
60 Cycles

Qu.	KVA	Make	Type	Ph	Voltages
1	3000	Whse.	Furnace	3	26400/13200x190
2	2000	G.E.	HVDDJ	1	66000x13800
3	1000	G.E.	H	1	2200x480
3	1250	G.E.	H	1	6600x550
1	1150	A.C.	OISC	3	13200x2300/480
1	500	Whse.	OISC	3	13400x216
9	300	G.E.	HT	3	2400x240/480
3	150	Whse.	OISC	1	33000x2300/4600
3	100	G.E.	OISC	1	2400x120/240
2	75	Upte	OISC	3	4160x240
1	50	Mol	Askerel	3	13200x120/208
7	10	G.E.	H	1	2300x115/230
9	7½	G.E.	H	1	2300x115/230
2	5	Mol	HE	1	113809x115/230



2000 KW—MG SET
IN STOCK

A. C. MOTORS
3 ph. 60 Cycle
SYNCHRONOUS

HP	Make	Type	Volts	Speed
1—4350	Cr. Wh.		4160/13800	514
2—3500	G.E.	TS	2300	257
1—2500	Whse.		2300	720
2—2100	G.E.	ATI	2300	360
2—2000	Whse.		2300	120
2—1750	G.E.	ATI	2300	3600
3— 735	G.E.	ATI	2300/12000	600
1— 500	G.E.	TS 7657	2400/4800	600
1— 450	Whse.	Eng.	2200	128.5
1— 450	Whse.		2300	450
2— 250	G.E.	TS	2200	150
1— 300	Whse.		2300	720
1— 150	Whse.		440	600
1— 100	Whse.		550	600
1— 100	E.M.		220	1200
1— 100	E.M.		440	600

SLIP RING

1—1500	ABB		2300	720
1— 500	Whse.	CW	250	350
2— 500	G.E. unused	M-574Y	2200	900
1— 500	G.E.	IM	440	900
1— 400	Whse.	CW	440	514
1— 350	G.E.	MT447Y	2200/4000	253
2— 300	G.E.	ITC-5017	550	585
1— 300	Al. Chal.	ANY	2200	708
1— 300	A.C.		440	514
1— 250	G.E.	MT-454Y	4000	257
1— 250	G.E.	MT-5598	2200	1750
1— 250	A.C.		550	600
1— 200	Cr. Wh.	28QB	440	505
1— 200	G.E.	IM	440	435
1— 200	G.E.	MTP	440	1170
2— 200	G.E.	IM-17	440	580
1— 200	Whse.	CW	440	490
1— 200	G.E.	IM	440	600
1— 150	new Whse.	CW	2300	450
1— 125	A.C.		440	720
4— 125	G.E.	MT-566Y	440/2200	435
1— 100	G.E.	IM-16	2200	435
1— 100	G.E.	IM	440	600
3— 100	Al. Ch.	ANY	440	695
1— 100	G.E.	MT556	2200	900
1— 75	Whse.	CW-761	2200	1725

SQUIRREL CAGE

2— 650	G.E.	FT359BY	440	3750
2— 450	Whse.	CS	2300/4150	354
1— 300	G.E.	KT-574Y	2300	505
1— 200	G.E.	IK-17	440	580
1— 200	G.E.	KT557	440	1800
1— 200	G.E.	IK	440	865
1—75/150	G.E.	IK	440	450/900
1— 150	Whse.	CS	440	580
1— 150	Wrightse.	C88568	440	8.00
1— 125	Whse.	MS	440	485
1— 125	G.E.	KF-TEFC	440	3585
2— 125	Al. Ch.	ARW	2200	1750
1— 100	G.E.	IK-Vert.	2300	450
1— 100	G.E.	KT-513	2300/440	1750
2— 100	G.E.	IK	440	580

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MOTORS - M.G. SETS - CONTROL

NEW AND GUARANTEED REBUILT

M-G SETS

KW	D.C. Volts	A.C. Volts	Mfg.
500	125/250	2300	Whse.
400	125/250	2300	Whse.
300	250	2300	G.E.
200	250	550	Whse.
150	250	440	Whse.
100	275	2300	Whse.
50	250	440	G.E.
40	250	220/440	G.E.
30	125/250	2300/4000	G.E.
9	125	220/440	Burke
7½VS	250	220/440	Rel.
3VS	250	220/440	Rel.

A.C. CONTROLS

1—700 HP, 4000-3-60. West. manual, red volt. starter.
1—500 HP, 4600-3-60, G.E. CR-1034, man. red volt. starter.
1—150 HP, 2200-3-60 Roller Smith mag. red. volt. starter, auto-transformer type.
1—150 HP, Allen Bradley 220-3-60 magnetic, reduced voltage starter.
1—100 HP, 440-3-60 G.E. CR-7022Y1 wound rotor controller.
1—100 HP 2200-3-60 G.E. CR-7006Y1 magnetic, full volt. starter.
2—Size 5 G.E. magnetic starters, 220 or 440 v., NEMA 1 encl.
1—50 HP, EC&M automatic compensator, 440-3-60.
2—NEW C-H 25 HP, 440-3-60, magnetic, red volt. starter.
3—NEW C-H 15 HP, 440-3-60, magnetic, red volt. starter.

CRADLE TYPE DYNAMOMETERS

1—225 HP, Whse, 250 v. D.C. 300/2000 RPM, complete with Toledo automatic printing type scale.
1—150 HP, Whse., 275 v. D.C. 3000/5000 RPM, Frame 121, complete with all necessary control.

NEW MAGNETIC SLIP RING CONTROL

1—ALLIS 250 HP, 440 volt 125 HP, 220 volt) Reversing, 7 accel. steps, main line air ckt. brkr., fully magnetic, open or enclosed.

SLIP RING

HP	RPM	Volts	Mfg.
500	1200	220/440	Elliott (New)
400	300	2300	G.E.
350	450	2300	Whse.
200	450	2300	Burke
100	1160	440	G.E.
100	1800	440	G.E.
75	514	440	G.E.
75	720	220	G.E.
50	720	220	Whse.

SYNCHRONOUS

HP	RPM	Volts	Mfg.	Type
600	1800	2300	G.E.	100%
400	900	2300	Whse.	80%
200	1800	440	West.	100%
150	200	440	G.E.	80%
150	600	440	G.E.	100%
150	720	2200	G.E.	80%
150	900	230	G.E.	100%

230 V. DIRECT CURRENT

HP	RPM	Mfg.	Type	Brgs.
100	450/1350	Whse.	SK-183	SI.
50	400/1200	Rel.	651-T	SI.
50	200/800	E-D	50-S	Ball
50	300/900	G.E.	RF-16	SI.
35	400/1200	Ideal	DV	SI.
30	250/1000	Whse.	SK-131	S.SI
30	350/1050	Whse.	SK-60	SI
30	500/1500	Rel.	262-T	Ball
25	300/1200	Rel.	310-T	Ball
20	250/1000	Whse.	SK-111	SI.
20	300/1200	Rel.	310-T	Ball

D. C. CONTROLS 230 volts

2—200 HP G.E. magnetic reversing, dynamic braking starters.
1—125 HP Clark magnetic adjustable speed starter.
1—New 100 HP Monitor magnetic, adj. speed starter.
1—Westinghouse 75 HP, reversing, dynamic braking starter.
1—New 75 HP C-H Bul 6130H92 plain magnetic starters.
3—75 HP Cutler-Hammer plain magnetic starter, NEMA 4 encl.
1—50 HP Ward Leonard mag. adj. speed starter, dyn. braking.
2—40 HP G.E., magnetic, reversing, dynamic braking starters.
1—New G.E. 30 HP variable voltage controller CR 3270Y1, reversing, dynamic braking.
1—30 HP G.E. Planer Control CR 4630Y1, reversing, dyn. braking.
1—25 HP Westinghouse Class 8522 magnetic adj. speed starter.
(We can assemble any type D.C. control to your specifications)

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Power plant equipment. Steam, Diesel, electrical, boilers, engines, turbines, generators, new or used.

PENN MACHINERY COMPANY
Jackson, Miss.

AVAILABLE—450 KVA, 3 phase, 60 cycle SUBSTATION 12300 to 115/230 volts including primary switchgear.
700 also 450 HP 180 rpm 4160 volt UNUSED syn. motor.
1875 KVA condensing turbine unit.
WANTED—1000 KVA 90 or 100 RPM 480 volt 3 phase 60 cycle coupled generator.

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Application Engineers
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USED AUTOMATIC ELECTRIC PRECIPITATORS (Power Packs) 115 V, 60 cy, Single Phase Input —600 VA; Output—18 MA (4800-6000 Volts) Case Size 18"x14½"x24"—$50.00 each.

A A A STEEL, MCHRY, AND SUPPLY CO.
P. O. Box 6246, Dallas, Texas

REBUILT GUARANTEED POWER EQUIPMENT

MOTOR GENERATOR SETS

KW	MAKE	RPM	D.C.	A.C.
750	Al. Ch.	720	250	2300/440
400	West.	720	550	2300/4000
300 (2)	West.	1200	250	2300/4000
300	G.E.	1200	250	2300/4000
200	G.E.	1200	250	2300/4000
150	G.E.	900	550	2300/4000
150	G.E.	1200	250	2300/4000
100	G.E.	1200	250	2300/4000
35	G.E.	1800	125	220/440
13	Ideal	1800	125	220/440

ROTARY CONVERTERS

KW	MAKE	RPM	D.C.	Transformer
500	West.	1200	250	11450/9900
500 (2)	G.E.	1200		13200
400	West.	1200	250/125	13860
300/(2)	Al. Ch.	1200	250	2300/4000
300	G.E.	600	230	2300/4000
200	G.E.	1200	230	2300/4000

Will rewind above transformers to your requirements

PLATING M-G SETS

4—1500/3000 Amp. 6/12 V.—A.C. Motors

A.C. MOTORS

HP	MAKE	RPM	TYPE	WDG.
400	G.E.	450	MT	S.R.
300	G.E.	450	IM	S.R.
200	G.E.	600	IM	S.R.
150	G.E.	600	ATI	Syn.
100	G.E.	450	IM	S.R.
100	West.	1200	CS	S.C.
100	West.	900		Syn.
100	G.E.	1750	IK	S.C.
60	West.	575	CW	S.R.
50	G.E.	1750	KT	S.C.
50	G.E.	900	KT	S.C.
30	G.E.	900	KT	S.C.
30	G.E.	1200	KT	S.C.

TRANSFORMERS 1 PH. 60 CY.

KVA	MAKE	PRI.	SEC.
1—300 (3 ph)	G.E.	23000	22000
2— 200	Al. Ch.	22000	2200
3— 75	Kohlman	13200	110/220
3— 100	West.	13200	2300
5— 25	West.	2300	110/220

D.C. MOTORS

HP	MAKE	TYPE	VOLTS	SPD.
300	Cr. Wh.	CCD	230	1100
300	West.	SK	230	300
220	West.	SK	230	175
150	G.E.	DLC	230	800
60	West.	SK185	230	435
50	West.	SK113	230	1750
50	Rel.	T185	230	1700
30	West.	SK93	230	1750
25	Rel.	T310	230	400/1000
20	Rel.	T282	230	400/1000
20	West.	SK83	900	1750
15/19	West.	K5	230	650/550
13	West.	SK113	230	825
10	West.	SK100L	230	400/1600
10	West.	SK80	230	730/1460
10	West.	SK60L	230	1150
5½/7½	West.	K3	230	680/585
5	West.	SK70	230	400/1000

AIR COMPRESSORS—HOISTS

142 CFM Ing. Rd. 100# pressure, belted 30 HP
356 CFM Chic. Pneu. 12"x10" 100# Pressure.
½ Ton—AC American
1 Ton (3)—DC Shepard
3 Ton—AC with motor trolley
4 Ton—DC Brown

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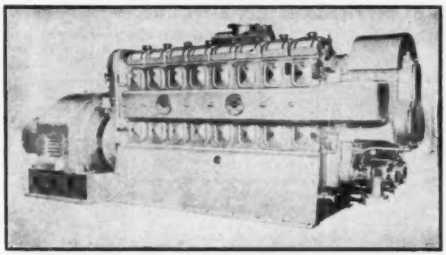
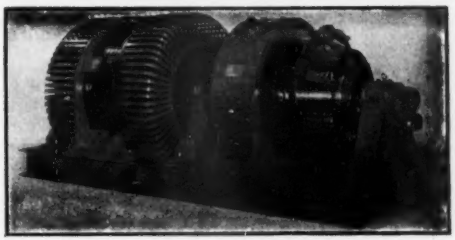
The O'Brien Machinery Company employs modern techniques, experienced craftsmen and the latest shop equipment to provide you with top quality, new, rebuilt and reconditioned machinery.



375 KVA GM DIESEL GENERATOR SET



500 KW WEST. MOTOR GENERATOR SET

MOTOR GENERATOR SETS

1—1000 KW West. 250 volt Flat Compound 500 RPM 1440 H.P. West. Syn. Mtr. .8 P.F. 3/25 cycle 2300 V. A.C. & D.C. Panels
1—500 KW Westinghouse 250 Volt 900 RPM with 720 H.P. West. Syn. Motors 3/60/6600/13200 volt, Serial #813047 (year 1935) See actual photo above.
1—500 KW Crocker Wheeler CCD, 250 volt 720 RPM with 750 KVA Cr. Wh. Syn. Motor 3/60/2300 V. A.C. & D.C. Panels.
1—300 KW West. 3 wire 125/250 Volt 1200 RPM Generator (1938 year). Can furnish with suitable motor. Advise Requirement.
2—150 KW G.E. Type MPC—250 Volt 1200 RPM 3/60/2300/200 H.P. Syn. Motor Drive A.C. & D.C. Panels.
1—100 KW Al. Ch., 250 V. 1200 RPM 150 H.P. Syn. Mtr. 2/60 or 3/60 any voltage.
1—100 KW G.E.—C.D.—125 Volt D.C. 150 HP GE Syn. Mtr., 3/60/220/440/1200 RPM.
1—75 KW Burke 250 V. 900 RPM 113 H.P. Burke—Syn. M.D. 2 or 3 ph, any voltage.
2—50 KW GE 500 Volt DC, 75 HP, 3/60/440/1200 RPM.
Smaller Sizes and Types—Advise Requirements

OISC TRANSFORMERS

Qu.	KVA	Make	Pri. V.	Sec. V.	Phase
3	4000	GE	33000	13200	1
3	1000	GE	13200	2300	1
3	1000	West.	33000	2300	1
1	1000	Penna.	13200	480	1
1	1100	West.	4440	440	3
3	833	GE	13800	460	1
3	750	West.	2300	230	1
3	500	GE	13200	2300	1
3	333	GE	2400	480	1
3	333	GE	13200	2300	1
3	250	West.	13200	2300	1
3	200	GE	7200	120/240	1
3	200	GE	13200	2300	1
3	200	Mal.	2300	220/440	1
3	200	GE	13200	2300	1
3	200	GE	7200	2300	1
3	150	GE	33000	220/440	1
3	150	Niag.	2400	240/480	1
3	100	West.	11000	480	1
3	100	GE	7200	120/240	1
2	100	GE	2300	115/230	1
3	75	Mal.	2300	115/230	1
3	50	GE	13200	120/240	1
3	50	GE	13200	2300	1
4	37½	West.	2400	240/480	1
3	25	West.	2300	115/230	1
3	25	West.	6900	2300	1
2	15	GE	2400	120/240	1
3	10	GE	220	110	1
10	1½	GE	2400	120/240	1

DIESEL & GASOLINE GENERATOR SETS

6—875 KVA G.E.—Busch Sultzer 3/60/2300/275 RPM, Complete Plant, 1940
1—580 KVA F.M. 3/60/2200/300 RPM
5—475 KVA Cooper Bessemer 400 RPM 3/60/2300, Complete Plant, New 1940
2—438 K.V.A. GM—West. 3/60/220 360 RPM —New 1937. Complete Plant.
1—375 K.V.A. GM 8-268A, 3/60/480/1200 RPM
1—300 K.W. GM New 8-268A, 230 DC.
1—187 KVA G.M. Twin 6-71 Portable, 3/60/220/440 New
1—125 K.V.A. Hercules. 3/60/220/440/1500 Hrs
1—56 K.V.A. Climax Gasoline, 3/60/220/1200.
2—45 K.V.A. Chry. New 6 Cyl. 3/60/220/440.

ELECTRIC MOTORS

Qu.	HP	Make	Type	Volts	Speed
1	1000	West.	CW	2300	450
1	600	West.	CS	2200	600
1	500	AC	ARX	2300	1800
1	500	West.	CS	6600/2300	514
2	400	G.E.	IK	2300	1800
1	400	West.	TEFC	440	1800
1	400	West.	CW	440	514
1	400	G.E.	Syn.	2300	450
1	350	G.E.	MT18	2300	400
1	315	G.E.	Syn.	2200	720
1	200	West.	Syn.	2300	1200
1	150	Ideal	Syn.	220	1200
1	125	West.	Syn. 3 brg.	550	600
2	100	G.E.	Syn.	440	200
1	75	West.	CW	440	1200
1	50	West.	CS	400	3600

TURBO GENERATORS

1—1250 KVA DeLaval Non-Cond. 3/60/2300. New 1940 240 psi 50 lb. B.P.
1—780 KVA G.E.-Moore 3/60/2300/3600 RPM Non-Cond. 180 PSI 35 lb. B.P. New 1936.

TURBO GENERATORS (Con't)

1—500 KVA West. Non-Cond. 3/60/220/440, 150 PSI 10 lb. B.P.
1—375 KVA West. Non-Cond. 3/60/440, 125 PSI 5 B.P. New 1938.
1—200 KVA Moore Non-Condensing 3/60/480, 195 PSI, 100° F, 100# BP. Year 1936.
1—187 KVA West. Non-Cond. New 1930 3/60/440 110 psi 10 lb. B.P.
1—94 KVA Worthington Non-Cond. 3/60/220 140 psi 5 lb. B.P.
1—75 KW G.E. Non-Cond. D.C. 125 volt.

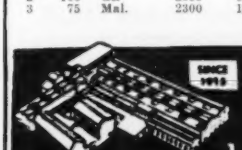
AIR COMPRESSORS

1—12,000 CFM I.R. Turbo 3.25 lb., direct 250 H.P., 440/3/60/3600.
1—5600 CFM I.R. PRE-2, 42/25½x30, 100 lb. direct 930 HP Syn. 1 P.F. 2300/60/3.
1—4690 CFM I.R. PRE-2 48/24x27 100 lb. direct 804 HP Syn. .8 PF 2300/60/3.
1—3000 CFM GE Turbo 5 lb. direct 90 HP 440/3/60/3600.
2—1400 CFM Sullivan WJ 8 Angle Cpd. 100 psi 22/13x16 belt.
1—900 CFM CP 100 lb. 9CP Portable Diesel Compressor, Pneu. tires.

BOILERS

1—610 H.P., Keeler 3-drum 250# A.S.M.E. with superheaters.
1—540 H.P., Keeler Water Tube 250# A.S.M.E.
2—500 H.P., B&W Sterling 200# A.S.M.E. Stoker Fired.
1—500 H.P., Cleaverbrooks 200# A.S.M.E. Heavy-oil 3/60/440.
1—480 H.P., Keeler 3-drum 250# A.S.M.E. with Superheaters.
1—400 H.P., Keeler 3-drum 250# A.S.M.E. with Superheaters.
1—390 H.P., Springfield 300# A.S.M.E. Cross-drum Water-tube Stoker Fired.
2—365 H.P., Springfield 250# A.S.M.E. Water Tube Foster Wheeler Sidewalls.
1—352 H.P., Keeler 250# A.S.M.E. Water Tube Cross Drum.
1—350 H.P., Erie City 150# A.S.M.E. Water tube, oil fired.
1—350 H.P., Keeler CP 160# A.S.M.E. Stoker Fired.
3—330 H.P., Heine Water Tube 200# A.S.M.E. Long Drum.
2—214 H.P., Pacific 15# A.S.M.E. Coil Fired.

"Everything from a Pulley to a Powerhouse"



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GET MORE FOR YOUR MONEY FROM HEMPHILL GUARANTEED EQUIPMENT

GUARANTEED GOOD BECAUSE REBUILT AND TESTED BY —HEMPHILL ELECTRICAL ENGINEERS—

TRANSFORMERS—60 Cycle

Qu.	KVA	Make	Type	Ph.	Voltages
1	1500	Penna.	OISC	3	4150x2400
1	1500	GE	Fernsal	3	4150x2400
1	500	Kuhl.	OISC	1	4600x2300
2	400	Pitts.		3	3600/4800x240/480
1	333	GE	OISC	1	13200x220/440
3	333	West.	OISC	1	2300/575
1	225	Stand.	OISC	1	440x220
1	200	GE	RT	3	2300x230
1	200	Pitts.	ODSC	1	4000x110/220
1	200	Mal.	C	1	2300x220/440
2	200	Al. Ch.	OISC	1	460x120/240
3	150	Pitts.	OISC	1	240x120/240
3	100	Wagner	HEB	1	240x120/120
1	100	Amer.		1	13800x2300
3	100	GE	Auto	1	4150YZx2400Y
9	50	GE	B	1	13750x135x216Y
1	50	Al. Ch.	ODSC	1	13530x120/240
2	50	Pitts.	Sub	1	13530x120/240
1	50	Amer.	OISC	1	6600/13200x220/440
1	50	Amer.	WF	1	240x240/30
1	50	GE	KS	1	2300x230
1	50	Amer.	AT	1	220/220/44
1	37½	GE	H	1	2200x110/220

SYNCHRONOUS MOTORS

Qu.	H.P.	Make	Speed	Type	Volts
1	300	El. Mach.	720	TEFC	2200
1	150	GE	720	ATI	2300
1	150	GE	1800	TH	220
1	150	Whse.	900		220

MOTOR GENERATOR SETS

Qu.	KW	Make	Speed	DC	AC
7	1000	GE	514	600	2300/4160 3ph.
1	300	Whse.	900	250	220/440 3ph.
1	150	GE	720	125/250	2300 3ph.
1	150	Whse.	900	125	4150 3ph.
1	125	CW	1200	125	220/440 SC
1	100	GE	900	250	2300 3ph.
1	94	GE	1200	60	440 SC
1	94	GE	1200	60	4150 3ph.
1	30	GE	900	230	230 3ph.

SLIP RING MOTORS

Qu.	H.P.	Make	Speed	Type	Volts
1	1750	GE	4160	K	3600 Sq. Cg.
1	500	GE	447	IM	900
1	400	Whse.	450	CW	550
1	250	Whse.	900	CW	440
1	300	GE	1800	MT	2300
1	300	Whse.	900	CW	440
1	200	GE	900	MT	440

SLIP RING MOTORS—(Con't)

1	100	GE	600	IM	440
1	75	GE	1200	MT Vert.	220
1	60	GE	1750	MT	220
1	60	GE	900	MT	440
1	50	GE	1720	MT	220
1	50	Whse.	900	CW	220
1	50	GE	1700	MT	220
1	50	GE	600	MT	220
1	40	G.E.	1390	MT	220

TURBO GENERATOR

250 KVA Elliott 208V 200# non-condensing.

SPECIAL M.G., A.C. WELDER

1—176 KVA Whse., 220 V. 57 PF, 1200 RPM, 1 ph., with 75 HP Slip Ring, 440V, type CW. Exc. & Control w. flywheel.

SPECIAL WELDING

1—150 KVA GE, type KWC, 1 ph., 550 V, sec. 12.22/6.05 V, Thryatron Spot and Seam, Control CR 7503

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PHONE NEW YORK—LONGACRE 3-3227
PHONE NEW JERSEY—UNION 3-7602

SLIP RING MOTORS
3 phase 60 cycle

HP	Make	Speed	Type	Volts	Frame
4—3500	GE	120	IM		2300
200	Ideal	1200	AV Vert.		4000
200	West.	600	CW		220
200	GE	600	IM	220/440	
150	West.	1200	HP	2200/4000	
75	GE	900	MT BB		440
75	GE	1760	IM		220
75	AC	600	3 bearing		220
70	Eng. Electric	1200	open BB		440
60	CW	1800	SR Vert.		220
50	GE	1800	MT Vert.		220
50	AC	1800	ARY		440
50	GE	1200	IM		220
50	AC	900			550
50	Western Elec.	900	MT	220/440	
50	GE	900	MT		220
50	GE	600	IM		220
75	West.	600	CCL		220
75	E.M.	500	IC-DPBB		440
60	Howell	1200	TEBB		440
60	AC	1200	AR	220/440	
60	GE	1800	K	220/440	
60	GE	600	IK		440
50	Master	1800	Vert. DPBB	220/440	
50	AC	900	Open SB		220
40	GE	1200	K-BB	220/440	
40	AC	1760	ABZZ X-Prf.	220/440	
40	FM	900	Open BB		220
40	GE	720	KT SB		440
2—30	GE	1800	KT SB	220/440	
30	CW	1200	AC BB		440

SQUIRREL CAGE MOTORS
3 phase—60 cycles

HP	Make	Speed	Type	Volts
200	GE	600	IK	220/440
150	GE	600	IK	2300
100	Wagner	1200	CI-TEFC	220/440

SYNCHRONOUS MOTORS
3 phase 60 cycle

115	Elect. Mach.	600	Open SB	220
50	Ideal	1200	SM	220

STEAM TURBINE

350 HP, 5000 RPM Westinghouse turbine with reducer, type C-25, output speed 1000 RPM, 150# steam, 20# exhaust.

DYNAMOMETER

600 HP, 1000/4000 RPM, type 2025A, 250 volts, Serial #1872.

WM. KECK'S SONS

Electric Motor & Engineering Service

201 N. Bluff Street — Joliet, Illinois

BARGAINS IN STOCK

2000 KW. 3-60-2300 G.E. Turbo-Gen. cond.
1000 KW. 3-60-480 G.E. Turbo-Gen. ext.
750 KW. 3-60-600 G.E. Turbo-Gen. ext.
500 KW. 3-60-480 G.E. non condensing.
1800 Sq. Ft. C. H. Wheeler surface condenser. C. H. Wheeler air ejector.
806 Cu. Ft. Chicago Pneumatic Compressor.
500 KW. 250 v. Gen. Elec. rotary.
2000 Amp. 8 volt Plater
100 KW. 250 volt Motor-Generator.
150 KW. 250 volt Motor-Generator
500 KW. 250 volt, 900 RPM. Generator.
75 KW. 125 volt motor generator.
50 KW. 3-60-440 Caterpillar diesel.
30 KW. 3-60-220 Ready Power Plant.

Large Stock: 110 and 220 volt DC motors, constant and adjustable speed.

Thousands of 3 phase motors, all types and sizes.

Oil Circuit Breakers.

Line Voltage Regulators.

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What Do You NEED?

KEYSTONE POWER PLANT EQUIPMENT CO.
8403 HEGERMAN ST., PHILA. 36, PA.

DIESEL UNITS

875 KVA Wghse.-DeLaVergne
512 KVA GE.-Worthington
375 KVA Elec. Mchy-Buckeye 8 cyl.
312 KVA (2 Wghse.-Worthington 6 cyl.
250 KVA Elliott-Buckeye 5 cyl.
220 KVA (2) Wghse.-Buckeye 7 cyl.
187 KVA Ideal-Buckeye 6 cyl.
75 KVA (2) General Motors
50 KVA GE-Caterpillar
37 KVA General Motors

TURBO UNITS

1563 KVA GE (non-cond)
937 KVA GE (non-cond)
625 KVA Allis Chal.-Elliott (Non-Cond)
300 KVA Allis Chal.-Elliott (Non-Cond)

BOILERS

395 HP. Union, type L, 300#
309 HP. Comb. Engr., 160#
300 HP. Keeler, CP 300#
255 HP. (2) Comb. Engr. 200#

POWER PLANT EQUIPMENT CO., INC.
39 Cortlandt St. New York, N. Y.

1—125 KW 400 RPM 187½ HP Buckeye Diesel Generator Set with all accessories.
1—225 HP Buckeye Diesel 400 RPM Belted Unit

ROBERT L. NEISWANDER
LIMA, OHIO PHONES 42867, 65817

Special Offering

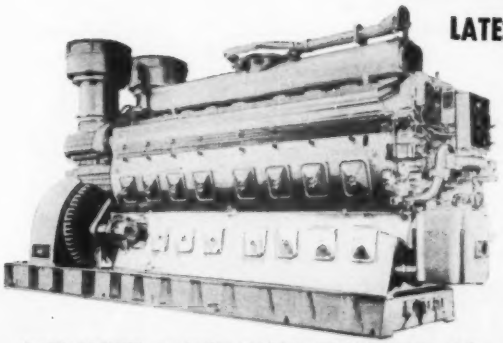
5000 KW DIESEL GENERATOR PLANT

consisting of

FIVE 1000 KW GENERAL MOTORS

Model 16-567B

DIESEL GENERATOR SETS



GMC MODEL 16-567B DIESEL GENERATOR SET

LATEST TYPE—CURRENT PRODUCTION MODEL

Available For Immediate Delivery

PRACTICALLY NEW

Less than 3000 Hours Total Service
Can be inspected under full load
test run—NEW UNIT—one year guarantee

This represents a rare opportunity to procure modern latest design Diesel equipment identical in every respect to the current equipment obtainable from the manufacturer. Each Diesel set is complete in every detail including many "special" and "Extra" auxiliaries and accessories. Units can be purchased singly or in total—all priced to sell.

DESCRIPTION ENGINE AND GENERATOR

Each unit consists of a 1440 BHP General Motors Corporation Model 16-567B Diesel engine operating at 720 RPM. The engine has 16 cylinders, arranged in two banks forming a 45° vee, 8.5" bore, 10" stroke. Engine is directly connected to a 1000 KW, 1250 KVA, Electric Machinery Mfg. Co., AC generator wound for 2400/4160 volt, 3 phase, 60 cycle service. Engine and generator are mounted on a welded structural steel common sub-base. Each unit is complete with all standard auxiliaries and accessories, including filters, strainers, pumps, gauge board, pyrometer, thermocouples, starting motor, exhaust muffler, lubricating oil cooler, engine tools.

OTHER ACCESSORIES

Included with each engine-generator unit is special ITE metal-clad switchgear with 100,000 KVA interrupting capacity breaker electrically operated, Young radiator for jacket water cooling, including thermostatic valves for water and lube oil, fresh water expansion tank, fuel oil transfer pump, fuel oil meter and liquidometer, Cycoil oil bath air intake filter silencer, flexible piping for air intake and exhaust, miscellaneous piping. flanges, adapters, valves, and fittings for air intake, exhaust, water, lubricating oil, and fuel oil systems.

IF REQUIRED

WE CAN SUPPLY 1000 KW 50 CYCLE Generators for each of these units from stock.

ACT TODAY — PHONE, WIRE, OR WRITE FOR FULL DETAILS
OTHER MODERN LATE-TYPE DIESEL SETS FROM 15 TO 1500 KW IN STOCK
SEE OUR OTHER AD PAGE 286

ALL OWNED AND OFFERED EXCLUSIVELY BY

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TELETYPE
NY 1-2804

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Western Union — WUX —
A. G. Schoonmaker Co. Inc., N. Y.
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50 CHURCH ST., NEW YORK 7, N. Y.

Plants and Warehouses: **Jersey City, N. J. and Sausalito (S.F.), California**

BREW-WOLTMAN OFFERS

TURBINE UNITS—60 CY.

1—6375 KVA G.E. Cond. 2300 V. 180-lb.
1—6250 KVA Allis Cond. 4000 V. 175-200 lb.
1—5000 KVA West. Cond. Extr. 480 V. 385-lb.
1—3750 KVA G.E. Cond. 2300 V. 185-lb.
1—3125 KVA West. N-C. 480 V. 400-lb. 30-35 lb. BP
1—2500 KVA Worth. N-C. 2300 V. 150-200 lb. 40-lb. BP
1—2500 KVA G.E. Cond. 600 V. 175-lb.
1—1875 KVA West. Cond. 2300 V. 170-lb.
1—1875 KVA G.E. Cond. 2300 V. 180-lb.
1—1563 KVA G.E. Extr. Cond. 2300 V. 200-lb.
2—1563 KVA Allis Cond. 2300 V. 200-lb.
1—1250 KVA Allis Cond. 2300 V. 150-200 lb.
1—938 KVA G.E. Extr. Cond. 240 V. 200-lb.
1—938 KVA West. Extr. Cond. 2300/4130 V. 200-lb.
1—938 KVA G.E. N-C 480 V. 150-lb. 10-15 lb. BP
1—750 KVA G.E. Extr. Cond. 480 V. 200-lb.
1—750 KVA G.E. Cond. 2300 V. 150-lb.
1—625 KVA Worth. N-C. 480 V. 125-lb. 10-lb. BP
1—625 KVA G.E. N-C. 480 V. 200-lb. 30-lb. BP

DIESEL ENGINE UNITS

1—1600 HP Fair. Morse 2300/4150 V. 60 cy.
1— 600 HP Enterprise 440 V. 60 cy.
1— 600 HP Enterprise Duel Fuel 2400 V. 60 cy.
2— 500 HP Winton 2400 V. 60 cy.
1— 250 HP Buckeye 240 V. 60 cy.

STEAM ENGINE UNITS—60 CY.

1—675 KVA Skinner Vertical Uniflow 480 V
1—750 KVA Ames Vertical Uniflow 480 V.
1—200 KVA Skinner Uniflow 230 V.
2—187 KVA Ames Vertical Uniflow 240/480 V
1—156 KVA Ames Vertical Uniflow 240 V.

MOTOR GENERATOR SETS—60 CY.

QU.	KW	MFR.	VOLTS-DC	A.C.	RPM
1	2000	G.E.	600	4000	450
1	1500	G.E.	600	4150	600
2	1000	West.	660	4150	900
1	200	West.	275	2200	900
2	200	G.E.	250	4150	1200
2	150	G.E.	250	2300	1200
1	150	West.	275	440	900
1	75	Ridgway	125	220	1200

SYNCHRONOUS MOTORS—60 CY.

QU.	HP	MFR.	VOLTAGE	RPM
2	2500	A.C.	13200	514
2	700	West.	2300	200
1	600	G.E.	440	1800
1	600	G.E.	2300	240
1	300	G.E.	2300	600
1	300	West.	2300	900

FREQUENCY CHANGERS

QU.	KVA	MFR.	CYCLES	RPM
1	12500	G.E.	25/60	380
1	3750	G.E.	25/60	300
1	3125	G.E.	25/60	300
1	2500	G.E.	25/62½	750
1	1875	A.C.	60/25	300
1	1700	West.	60/24	720

OIL CIRCUIT BREAKERS—Outdoor

1— 600 A. 73 KV G.E. FHKO-236-500
1— 400 A. 37 KV G.E. FHKO-136-350
1— 400 A. 37 KV G.E. FHKO-236-500
4— 600 A. 15 KV G.E. FHKO-139-750
1— 600 A. 15 KV G.E. FHKO-136-250
1— 600 A. 15 KV G.E. FHKO-136-1328 BS
1—1200 A. 15 KV G.E. FKO-139-350
1— 400 A. 7.5 KV G.E. FKO-227-50

1—6000 A. 600 V G.E. AL-2-100 AIR

TRANSFORMERS

4— 3333 KVA West. 66000—33000
4— 500 KVA West. 69000—6900
3— 333 KVA G.E. 69300—2400/7200
3— 300 KVA G.E. 66000/33000—2300, 3 ph.
1— 75 KVA A.C. 66000/24000—7200/12470 Y
3— 200 KVA West. 45000—2400/7200
3— 150 KVA G.E. 44000—7200/12470 Y
3— 75 KVA West. 44000—7200/12470 Y
3— 8333 KVA West. 43800—13900
2— 900 KVA G.E. 36300—2300, 3 ph.
1—18750 KVA A.B.B. 34840—11000, 3 ph.
3— 300 KVA G.E. 33000/66000—2300 3 ph.
4— 200 KVA A.C. 34500—6900/11950 Y
3— 150 KVA Wag. 33000—7200/12470 Y
3— 100 KVA A.C. 33000—7200/12470 Y
3— 100 KVA West. 33000—240/480 NEW
3— 75 KVA Wag. 33000—7200/12470 Y
4— 450 KVA A.C. 25410/44000—13280/23000
3— 1250 KVA G.E. 23000—2300/4000
3— 100 KVA G.E. 22000—7200/12470 Y
1— 4000 KVA Mol. 13800—460, 3 phase.
6— 200 KVA G.E. 13200—2300
3— 200 KVA G.E. 13200—230/460
2— 200 KVA G.E. 11500—220/110
3— 150 KVA Mol. 11000—2300
3— 250 KVA Pitts. 7200—230/440
3— 200 KVA Wag. 7200/12470 Y—2400
3— 150 KVA Wag. 6900—2300
4— 100 KVA G.E. 6900/11900—2400
3— 37½ KVA G.E. 6900—230/460
3— 1500 KVA A.C. 2300/4000 Y—2300
3— 333 KVA G.E. 2300—230/460
1— 100 KVA G.E. 2300—575, 3 ph.
6— 50 KVA West. 2400—114/228 DRY TYPE
3— 15 KVA Stand. 450/225—117 DRY TYPE

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50 Church Street — New York City 7, — WOrth 4-1470

POWER PLANT EQUIPMENT

SPECIAL OFFERINGS

TURBO-GENERATORS

2—4000 KW, 2300 V., 150 # Cond.
1—3500 KW, 4000 V., 150# Cond.
1—4000 KW 2300 V., 400# Cond.
1—3000 KW 13,200 V., 425# Extr. 170# Non-Cond.
1—2500 KW, 480 V., 150# Cond.
1—2500 KW, 550 V., 250# Cond.
1—1500 KW, 2300 V., 200# Cond.
1—1250 KW, 2300 V., 250# Extr.
1—1000 KW, 2300 V., 175# Extr.
1—1000 KW, 4160 V., N.C. 1949
1— 500 KW, 4160 200# N.C.
2—1000 KW, 480 V., 180# Cond.
1— 750 KW Consisting of
1—500 KW, 550 V., AC
1—250 KW, 250 V., DC
Non-Cond. 150#

DIESEL GENERATORS

1—1000 KVA, 2400 V.
1— 700 KW, 480 V.
1— 540 KW, 480 V.
1— 437 KW, 480 V.
1— 200 KW, 480 V.

FIRE PUMP

1—New 1000 G.P. Turbine Driven

BOILERS

3—50,000# pr hr. 275# (1949)
1— 850 H.P. 250#
1— 450 H.P. 225# 1942
1— 400 H.P. 200# 1941
2— 250 H.P. 200# 1940

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DIESEL and GASOLINE

Engines and Generator Sets
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MIDWEST UTILITIES POWER EQUIPMENT CORP.
1270 W. Augusta Blvd., Chicago 22, Ill.
EVergiade 4-4511

SLIP RING MOTORS

220 or 440 volt, 60 cycle, 3 phase, slip ring Motors Rebuilt

H.P.	Make	Type	Speed	Description
400	G.E.	I-M	1200	S.B.
300	G.E.	I-M	1200	S.B.
200	G.E.	I-M	1200	S.B.
150	G.E.	I-M	1200	S.B.
150	G.E.	I-M	1800	S.B.
100	G.E.	MT-300	1800	S.B.
100	G.E.	I-M	900	S.B.
100	G.E.	I-M	720	S.B.
75	G.E.	MT-343	1200	S.B.
75	G.E.	I-M	900	S.B.
75	West.	CW	720	S.B.
75	G.E.	I-M	720	S.B.
60	G.E.	MT-333	1800	S.B.
40	G.E.	I-M	1800	S.B.

BRAND NEW SQUIRREL CAGE MOTORS

Totally enclosed, fan cooled, explosion proof, open 220 or 440 Volt, 60 Cycle, 3 Phase

H.P.	Make	Type	Speed	Description
150	G.E.	K-6326	3600	TEFCBB
150	G.E.	K-6328	1800	TEFCBB
125	G.E.	K-6626	1200	TEFCBB
100	West.	CS-5075	1800	TEFCBB
100	West.	CS-504	1800	B. B. open
75	West.	CS-504	3600	TEFCBBXP
75	A.C.	ARZ	1800	TEFCBB used
75	West.	CS-504	1800	TEFCBBXP
75	West.	CS-445	1800	B. B. open

NEW SQUIRREL CAGE MOTORS

75	F.M.	QS-445	1800	B. B. open
75	West.	CS-505	1200	TEFCBBXP
60	West.	CS-5045	1800	TEFCBBXP
60	G.E.	K-3945	1800	TEFCBBXP
60	L.A.	OG-44	1800	B. B. open
60	F.M.	QS-444	1800	B. B. open
50	Master	FB-404	3600	TEFCBBXP
50	G.E.	K-445	1800	TEFCBB
50	G.E.	K-405	1800	S. B. drip
50	West.	CS-445	1200	B. B. open
50	G.E.	K-505	900	TEFCBBXP
40	A.C.	AR-444	3600	TEFCBBXP
40	G.E.	KP-405S	1800	S. B. Splash
40	West.	CS-405	1800	TEFCBB
40	L.A.	K-405	1800	TEFCBBXP
40	G.E.	404	1800	B. B. open

SQUIRREL CAGE MOTORS REBUILT

220 or 440 Volt, 60 Cycle, 3 Phase, Open

H.P.	Make	Type	Speed	Description
200	Wagner	RP-2-28	1800	S. B.
200	Wagner		1200	S. B.
200	G.E.	K-554	900	S. B. new
150	West.	CS	1800	S. B.
150	G.E.	I-K	1200	S. B.

REBUILT SQUIRREL CAGE MOTORS

H.P.	Make	Type	Speed	Description
150	G.E.	I-K	720	S. B.
100	West.	CS	1800	S. B.
100	G.E.	I-K	1500	S. B.
100	G.E.	I-K	1200	
100	G.E.	KT-347	1200	S. B.
100	West.	NS	1200	S. B.
100	West.	CS	900	S. B.
100	G.E.	I-K	720	S. B.
75	West.	CS	1800	S. B.
75	West.	CS	1200	S.B.
75	G.E.	I-K	900	
75	G.E.	KT-343	1200	S.B.
75	West.	CS-WL-607	1200	S. B. B.
75	G.E.	KT-552	900	S. B.
75	G.E.	KT-352	900	S. B.
75	G.E.	KT-348	720	S. B.
60	G.E.	KT-333	1800	S. B.
60	G.E.	I-K	1200	S. B.
60	West.	CS	1200	S. B.
60	G.E.	KT-548	900	S. B.
60	G.E.	I-K	900	S. B.
50	G.E.	I-K	1800	S. B.
50	Cr. Wh.	25R	1800	S. B.
50	G.E.	KT-327	1800	S. B.
50	G.E.	KT-338	1200	S. B.
50	West.	CS	1200	S. B.

We hav ein stock explosive proof motors 220/440/60/3 ranging in HP from ½ to 50 HP 900 to 1800 RPM.
We also carry in stock a large quantity of used electric motors from 1 HP up to 500 HP., generators, transformers and control equipment. Upon receipt of your inquiries, we shall be glad to quote.

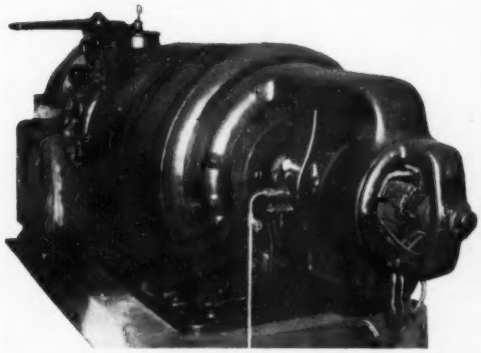
POWER EQUIPMENT COMPANY

8 CAIRN ST.—P. O. BOX 534—ROCHESTER 2, N. Y.—Telephone: Genesee 5629

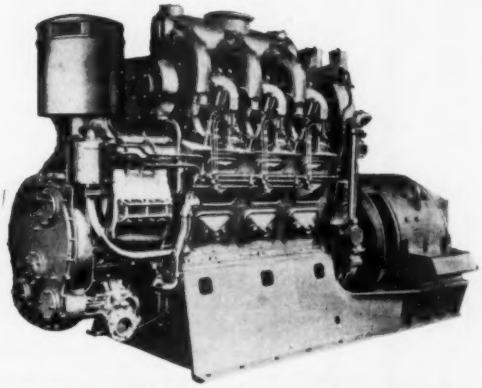
BARGAIN OFFERINGS IMMEDIATE DELIVERY

Turbo Generators—Unaflow Engine Generators—Diesel Generators

All Equipment Priced to Sell



625 KVA G.E. 480 VOLT NON-CONDENSING UNIT



375 KVA GENERAL MOTORS 2300 VOLT DIESEL GENERATOR

TURBINE GENERATOR UNITS

Condensing—3 phase, 60 cycle

6250 KVA G.E., 5-stage, 2300/4160 volts, 200# PSI, 600°TT.
3750 KVA Westghse. 2300 volt, 200 PSI.
2500 KVA G.E., Type ATB, Form HT, 480 volts, 3600 RPM, 2-bearing generator LESS TURBINE.
2500 KVA Westghse. 2300 volt, 250 PSI. Complete installation including boilers.
1563 KVA (2) G.E. 480 volts, 200 PSI.
1000 KVA G.E. 450 volts, 275-400 PSI, 750°TT geared unit.
937 KVA Elliott, 2300 volts, 150-250 PSI.
781 KVA Allis, 480 volt, 150 PSI.
625 KVA Elliott 2300 volts, 250 PSI.

Non-condensing—3 phase, 60 cycle

5000 KVA G.E., 13,800 volt, 600 PSI.
1563 KVA G.E. 480 volt, 200-250 PSI, 15 to 20# ga. back.
1250 KVA (2) G.E., 2300 volts, 150 PSI, 10# gauge back.
937 KVA ALLIS 480 VOLT, 150#, 10# gauge back.
625 KVA G.E. 480 volt, 1250-150 PSI, 20# back, photograph above. Reconditioned and guaranteed.
250 KVA G.E. 480 volt, 150#.
125 KVA Westghse., 2400/480 volt, 125-250#, 5# ga. back. Geared unit.

UNAFLOW GENERATOR UNITS

3 phase, 60 cycle

750 KVA G.E. 2300 volt generator connected Ames Vertical engine, 190 PSI.
625 KVA G.E., 240 volt generator connected to Skinner horizontal engine.
500 KVA G.E. 240 volt generator connected Skinner Vertical engine, 150-175 PSI complete.
375 KVA Westghse., 2400/480 volt connected Ames Vertical engine.
175 KVA Westghse., 240 volt generator connected Skinner horizontal engine, 125-150# PSI, 5# gauge back.
62½ KVA Engberg, 480 volt Vertical engine generator unit, 150-200#.

DIRECT CURRENT UNITS

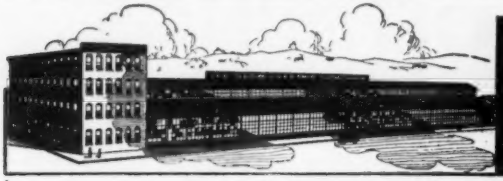
540 KW Westghse. non-condensing turbine 250 volts D.C. NEW, 200# PSI.
400 KW G.E., 3-wire, 250 volts, 360 RPM generator connected Skinner vertical engine 150 PSI—5# back.
300 KW Westghse. 3-wire, 250 volt 150/250# PSI noncondensing turbine.
300 KW (2) Westghse, 3-wire, 240/125 volt condensing turbines. 440# PSI.
250 KW Crocker Wheeler 125 volt generator direct connected Ames vertical non-condensing engine 150#.
100 KW (2) G.E. 120 volt condensing or non-condensing geared 200-275 PSI.
60 KW (6) Elliott 125 volt condensing or non-condensing 200-250 PSI.

DIESEL GENERATOR UNITS

3 phase, 60 cycle

2475 KVA G.E., 6900/4160 or 480 volts generator connected to Nordberg engine.
1875 KVA Westghse., 6900 volt generator connected Fairbanks Morse engine.
1000 KVA Westghse. 2300/4000 volt, 600 RPM generator complete with exciter, switchboard. Practically new.
937½ KVA G.E. 2400 volt generator connected General Motors engine.
475 KVA (4) Westghse. 2300 volt generators connected to Worthington engines (complete, Modern, 1900 KVA plant).
400 KVA (3) Elec. Mchy. 440 volt generators each connected to 6 cylinder Alco engine. Complete.
375 KVA Allis 2300/4000 volt generator connected General Motors engine complete installation. (Actual photograph above.)
250 KVA Fairbanks-Morse 2400 volt generator connected to Fairbanks Morse engine.
95 KVA Fairbanks-Morse 2400 volt generator connected to Fairbanks Morse engine.
20 KW Louis Allis, 125 volt generator connected 64 HP Hill engine.

UMC UTILITIES MACHINERY CORP.
1965 EAST 6th STREET • CLEVELAND 14, OHIO • CH. 1-0210



GLOW ELECTRIC CO.

4927 HARRIET ST. CINCINNATI 3, OHIO
PHONE MAIN 3024

MEMBERS OF AMERICAN REBUILDERS ASSOCIATION, A MEMBER BODY OF AMERICAN STANDARDS ASSOCIATION

SQUIRREL CAGE, OPEN 3 PHASE MOTORS

HP	RPM	VOLTS	DESCRIPTION
750	900	6600	Westinghouse
350	3600	2200	Westinghouse
300	900	440	G.E.
200	440	2200	G.E.--1
125	3600	220/440	A-C
125	1800	2200	A-C
115	1200	440	G.E.
100	1800	2200	Westinghouse
100*	1200	2200	G.E.-KF544
100	720	440	Westgh. 3 Brg.
85	3600	2200	G.E.
60	3600	2200	G.E.
60	1800	2200	G.E.
50	3600	220/440	G.E.-404S
50	1800	220	Triumph
50	720	2200	Westinghouse
40	1800	220/440	West.-444
40	900	440	G.E.
40	720	440	G.E.
35	3600	220	G.E.-KY
35	900	440	G.E.
30	1800	440	G.E.-KT323
30	720	220	G.E.
30	514	440	Stanley
25	3600	220/440	L-A
25	1800	220	L-A-HD
25	1200	220	Century
25	900	440	G.E.
25	900	440	G.E.
20	3600	440	A-C
20	1800	220/440	G.E.
20	1800	220/440	G.E.
20*	1800	220/440	Wagner
20	900	440	A-C
20	600	220	G.E.
15	3600	220	G.E.
15	1800	220/440	G.E.
15	1200	220	Imperial
15	900	220	Howell
15	720	220/440	A-C
10	3600	220	R. & M.
10	1800	220	Westinghouse
10	1200	220	A-C

* New Motors

MULTI-SPEED MOTORS 3 PHASE, 60 CYCLE

HP	RPM	VOLTS	DESCRIPTION
50/12½	900/450	2200	G.E., KT-356
40/20	1200/600	440	Westgh., CS-445
25/12½	1800/900	220	R&M, L-640
20	1880/1200/ 900/600	440	Century, SCN-504Y
20/10	1800/900	220	Century, SCN-27
15/10*	1800/1200	440	Westgh., CS-365
15	1880/900	220	R&M
15/7½*	1080/900	220	Wagner, 364
15	900/450	440	Reliance, B-405 high torque, high slip

SLIP RING MOTORS

HP	RPM	VOLTS	DESCRIPTION
400	514	440	West.-CW
375	1800	2300	Al. Ch.
350*	514	440	G.E., TE, FC, 88
300	1200	440	Westgh.-CW
300	720	2200	Al. Ch.
300	514	440	Al. Ch. 3 Brg.
250	600	2200	G.E.-117B
250	450	2200	C.-W.
250	450	2300	G.E.-1-17B
250	300	2200	Al. Ch.
200	1800	440	Al. Ch.
200	800	440	West.-CW
200	600	440	G.E.-1M
200	514	440	West.-CW
150	1800	440	G.E.-8KT
150	720	2200	Al. Ch.
120	900	550	Ideal
100	720	440	Al. Ch.
100	400	440	West. Elec. (GE)

* New

MOTOR GENERATOR SETS

D.C. OUTPUT KW	Voltage	Description	A.C. INPUT HP	RPM	Volts
1500	600	G.E., MCF	2190	720	13200
800	500	West., 3 unit	1200	1200	2300
750	550	G.E.	1070	900	2300
750	500	Westgh.	1070	900	13200
600	250	Westgh. (2-300KW Gen.)	1200	1200	2300
600	250	G.E.	900	900	2300
400	250	Westgh.-G.E.	650	1200	220/440
300	250	G.E.	440	1200	2300
200	125	G.E.-Westgh.	300	720	2300
200	125	G.E. (23 sy.)	300	734	440
200	250	G.E.-Westgh.	300	1200	440
100	250	Westgh.	147	1200	4300
75	125	G.E.	115	1200	440
50	125	C-W	85	1800	440
47½	125	Al. Ch.	104	1200	2300
40	250	Westgh.-G.E.	80	1200	220/440
22	125	Al. Ch.	33½	900	220
20	115	G.E.-Al. Ch.	28	900	220
15	250	Al. Ch.-L.A.	23	1800	220/440
12½	250	Westgh.	18½	1800	220
10	250	Westgh.	15	1800	220/440

PLATING AND ANODIZING SETS

D.C. OUTPUT AMPS	VOLTS	RPM	DESCR.	HP	A.C. END VOLTS	DESCR.
4000	2 to 8	425	Jantz & Leist			
2400	40/80	1200	Westgh.	200	440	WH Sync.
1500	3 to 40	900	HVW	100	440	HVW Syn.
1500/750	6/12	1200	Munning Loeb	15	440	GE—1 Cage
1200	60	1160	Century	108	220/440	Century, SCN-584
1000	60	1200	Century	100	440	Century Cage
1000	8	1200	Wagner	—	—	—
800	30	900	C-W	40	220	C-W, type 122Q
680	11	900	Westgh.	13	440	W.H. BB.
600	50	900	E-M	40	440	A-C
600	30	1200	W-E	30	440	GE
600	30	900	G.E.	25	440	GE
500	40	1200	G.E.	30	440	GE-KT
500	12	1200	Ideal	10	220	GE-KT
500	6	GE	Rectifier	—	440	—
416	12	1200	HVW	7½	440	GE-KT
400	40	1800	Hobart	25	220/440	Hobart
208	62	1800	G.E.	20	220/440	GE-KT

COMPLETE POWER PLANTS

STEAM — ELECTRIC — HYDRO — DIESEL

"Export Orders Carefully Executed"

FOR IMMEDIATE DELIVERY

TURBO-GENERATORS—Condensing—500 to 20,000 KW; some extraction type, pressures 200 to 450#. *On what size shall we quote?*
TURBO-GENERATORS—Non-condensing—300 to 3000 KW, 150# to 450#, some extraction with high back pressure. *What size interests you?*
STEAM GENERATORS—30000# to 100000# per hr. 150# to 450#.
BOILERS—Water Tube, Stirling & Straight Tube types 200 to 450#.
Special 2 500 H.P. B&W Co. Stirling Boilers 200#—excellent condition.
BOILERS—Fire Tube, 100 to 300 HP. 100 to 250#. *What boilers?*

TRANSFORMERS Quick Delivery, Various Sizes Rebuilt like NEW—Guaranteed. Motor-Generators, Rotaries, Frequency Changers, Large Motors & Diesel Generators.

Send us your INQUIRIES for ALL POWER MACHINERY

CHARLES B. REARICK 30 CHURCH ST. NEW YORK 7, N. Y.

DIESEL GENERATOR SETS

100 KW General Motors Model 3-268A direct coupled to: Westinghouse Alternators, 3/60/440 V., 1200 RPM. Inc. Switchboards. Rebuilt.

60 KW General Motors set, Model 6-71, 6 Cyl., 3/60/120/208 V., 1200 RPM.

50 KW Int'l. Harvester set, Model UD-14, 4 Cyl. 3/60/120/208 V. Rebuilt.

Other sizes in stock, AC & DC Units

ALJON ELECTRIC DIESEL CO.
904 Pacific St., Brooklyn 16, N. Y.
STerling 3-6515

Tradition Counts—AMERICAN Rebuilt Compressors

Stationary CFM	LBS	MAKE	Portables
66	100	I.R.	30' Worthington
93	100	I.R.—C.P.	60' Worthington
129	100	I.R. ES	85' Ingersoll Rand
166	135	I.R. ES	105' IR—Worth
173	100	I.R.	160' Worthington
210	100	I.R. ES	210' Worthington
254	125	I.R.	315' Worth—I.R.
368	100	I.R.	500' Worth—I.R.
528	100	I.R.	600' Worthington
60	250	Bury	
310	600	Worth	Vacuum Pumps Boosters
15	1000	I.R.	
110	3000	I.R.	

AMERICAN AIR COMPRESSOR CORP.
Dell Ave. & 47th Street
North Bergen, New Jersey

COMPLETE DIESEL PLANT

3—Fairbanks Morse units. 805 HP—556 KW; 690 HP—473 KW; 300 HP—200 KW. Model 33-E-14. 3/60/2400 volts. New 1940. Will sell all or part. With auxiliaries. Condition excellent.

MISSISSIPPI VALLEY EQUIPMENT CO.
507 Locust St. St. Louis 1, Mo.

RUBBER MILLS

2—Farrel-Birmingham 18" x 42", 3½" bearings, with a 75 H.P. synch. motor.

1—Calender 6" x 12" w.s. Rolls, motor driven.

DALTON SUPPLY CO.
2829 Cedar St. Phila. 34, Pa.

BARGAINS

IMMEDIATE DELIVERY

1—650 H.P. Casey Hedges Boiler, 225 psi, excellent condition. Price f.o.b. Indiana $8,400.00

1—75 H.P. Induction Motor, 2300 volts, 1800 rpm., rewound & guaranteed $900.00

FLETCHER SALES CO.
961 Baxter Ave., Louisville, Ky.

"Opportunity" Advertising:
Think
"SEARCHLIGHT"
First

MOTORS • GENERATORS • TRANSFORMERS

7 x 7 AIR COMPRESSOR

Ingersoll Rand 7x7 Class ERI—100#—with or without drive.

1—400 KW Westinghouse 500 V. DC 750 RPM 800 Amps. Motor—580 H.P. Synchronous 3 Ph. 25 cycle 440 V. 750 RPM.

ANODIZING M.G. SET

33 KW Gen. Elect. Type BR. Form C 60 V. DC. Direct connected to 50 HP 3/60/440/1800 Gen. Elect. Motor.

400 HP GEAR REDUCER

1—400 HP Nuttall (Westinghouse) Type LMR-25 Single Helical Heavy Duty Reducer—6-1 Ratio at 900 RPM with High Speed Shaft Extension for Brake.

400 HP SYNCH. MOTOR

1—400 HP Westinghouse Synchronous Motor. 3/60/2300/900 RPM. Unity P.F. with direct connected exciter—Late Type.

55" LIFTING MAGNETS

2—55" Cutler Hammer Magnets 250 Volts DC. Excellent Condition.

350 KW GENERATORS

2—350 KW General Electric Generators Type MPC, 250 Volt DC, 720 RPM Single Bearing Machines.

MOTORS

60-50-25 Cycle in Stock—All Sizes. Slipring—Squirrel Cage—Synchronous. All types of Control Equipment.

100 HP Westinghouse Slipring 3 Bearing 3/60/220/440/435 RPM.

100 HP Gen. Electric Type I form K 3/60/2300/600 RPM.

100 HP Gen Electric Type KT 356 3/60/2200/900 RPM.

125 HP Gen. Electric Type I form K 3/60/440/720 RPM.

125 HP G. E. Type KT 3/60/2300/1200 RPM.

150 HP G. E. Type KT 3/60/440/500 RPM.

150 HP Gen. Electric Type I form K 3/60/2300/900 RPM.

200 HP Gen. Electric Slipring Type I form M 3/60/440/600 RPM.

200 HP G. E. Type KT 3/60/440/600 RPM.

250 HP G. E. Type KT 3/60/440/720 RPM.

T.E.F.C. MOTORS

60 HP Westinghouse CS-607 3/60/440/900 X-Proof

50 HP Ideal New. 3/60/220/440/1800

2—20 HP Louis Allis ES. 365 3/60/220/440/1800 X-Proof

15 HP Louis Allis EX-364 360/220/440/1800 X-Proof.

125 VOLT DC MOTORS

1—100 HP Crocker Wheeler 125 Volt DC 850 RPM Ball Bearing

1—150 HP Crocker Wheel 125 Volt DC 850 RPM Ball Bearing.

Will make 1200 RPM 125 Volt Generators.

DC CIRCUIT BREAKERS

1—1000 AMP. Condit. 2 Pole

1—1600 AMP. Condit. 2 Pole

1—1600 AMP. Westinghouse 2 Pole

1—3000 AMP. Westinghouse 2 Pole

333 KVA TRANSFORMERS

4—333 KVA Gen. Elect. Transformers Type H Form VRW Primary 2400/4800 Secondary 240/480 Single Phase 60 cycle with Taps Immediate Shipment.

REBUILT TRANSFORMERS

3—100 KVA Pittsburgh 1/60/4800/230/460

3—75 KVA Pittsburgh 1/60/2300/4000Y/230/460

3—50 KVA Moloney 1/60/4800/230/460

3—50 KVA Westinghouse Type S. 1/60/2300/230/460

3—100 KVA G.E. 1 ph., 60 cy. 2400/4160 pri. 120/240 sec.

3—1667 KVA Wagner 1 ph., 25 cy., 23,000 pri., 575 sec.

ERIE ELECTRIC CO., INC. 124 CHURCH ST. BUFFALO, N. Y.
CL. 4758

FOR SALE

1—Curtis Steam Turbine #22189, 1250 KW, 3600 RPM, 3-Stage, 145 lbs. Gauge Condensing

Connected to:

1—G.E. Generator #2555846 Type ATB-2-1563KVA, 3600 RPM, Form T, Volts 480, Amps Arm. 1880, 60 Cycles, P.F. .8, 3 Phase, Amps Field 107, KW 1250

With below listed auxiliaries:

1—Wheeler Condenser #5735 with about 500 extra tubes and ferrules.

1—35 HP, 440 Volt Motor Connected to a Circulating Pump, 1150 RPM, 12" Suction, 10" Discharge.

1—Condensate Return Pump, 3" Suction, 2" Discharge.

1—Western Electric Exciter, 35 KW, 125 Volts, 280 Amps, direct connected to a 50 HP, 1200 RPM Motor, 440 volts.

1—Westinghouse Oil Switch, 2000 Amps, 7500 Volts.

1—General Electric Voltage Regulator complete with all the controls to operate.

1—Complete Set of Recording Gauges, both Pressure and Vacuum.

THE JAITE COMPANY
JAITE, OHIO

VARIABLE SPEED DRIVES
FREQUENCY CHANGERS
LOW-VOLTAGE GENERATORS
American ELECTRIC CORPORATION
DEPT. P, Box 133, INDIANAPOLIS, IND.

MOTOR GENERATOR SETS

Qu.	RPM	KW	Make	Type	Volts
4	1200	150	West.	SK-180	275
3-bearing factory sets — 2300/3/60. Syn. Motors					

GEAR-HEAD MOTORS 220/440/3/60

Qu.	HP	Speed	Make	Frame
8	60	427	G.E.	445
8	40	561	G.E.	405
3	20	194	West.	364
1	10	516	Master	326
37	7½	580	West.	284
1	3	280	Master	225
1	2	280	Master	225
1	1	280	Master	225
15	½	135	Master	5830

Many others in stock.

D. C. MOTORS, VARIABLE SPEED

HP	Make	Speed	Volts	Type
60	Diehl	500/1000	230	K-11
50	West.	750/1125	230	SK-153
27	West.	500/1500	230	SK-130
15	West.	850/1700	230	SK-123
15	C.E.	550/1650	230	RF-10
10	West.	400/1000	230	SK-90

ROTARY CONVERTERS 6-phase

Qu.	Make	KW	Speed	Volts
2	G.E.-HCC	1000	900	650
4	West.	500	1200	600

Switch Gear & Transformers.

SLIP RING MOTORS

HP	Make	Type	RPM	Volts
400	A-C	ARY	1765	2200
150	G.E.	I-15	900	220 or 440
150	G.E.	Mill	1150	220 or 440
125	G.E.	MT-547	1800	220-440
100	West.	C-W	720	220-440
75	W.E.	M	870	2200
50	A-C	ARY	900	220-440

Many others down to ½ H.P. Send us your inquiries.

SYNCHRONOUS MOTORS

HP	Make	Type	RPM	Volts
400	West.	Ped.-Brg.	900	2300
300	E.M.	3-brg.	450	2300
200	West.	P.B.	720	220-440
175	G.E.	ATI-PB	450	2300
150	G.E.	ATB	720	220-440

DIESEL GENERATOR SETS

KW	RPM	Mfg.	Volts
100	1200	Delco	440

Connected to Fairbanks-Morse 150 HP, 5¼ x 7¼, full diesel. New in 1945. Used very little.

15,000 A.C. & D.C. MOTORS IN STOCK, FROM 1/6 H.P. TO 2500 H.P.

SEND US YOUR INQUIRIES *GET OUR QUOTATION BEFORE YOU BUY*

LARGEST STOCK IN MIDWEST

BUCKEYE TRADING CORP.

1015 PAPIN STREET, ST. LOUIS 2, MISSOURI TELEPHONE CHestnut 3110

SLIP RING MOTORS 3-Ph., 60 Cy.

HP	Volts	Make	Speed
500 (3)	2300	G.E.	900
500	2200	G.E.	450
450	440/220	Whse.	514
350	2300/440	G.E.	450
300	2200	G.E.	360
300	440	Whse.	3600
250	440/220	Whse.	600
250	2200/550	G.E.	450
250	550/440	G.E.	1200
250	440	G.E.	600
200	440	G.E.	450
198	4000/2300	G.E.	1800
158	440/220	G.E.	450
158	440/220	Whse.	600
150	440/220	Whse. (2)	1800
145	4000/2300	G.E.	1800
125	2200/440	G.E.	600
125	550/440	G.E.	1200
125	440/220	G.E.	600
100	440/220	G.E.	900

SYNCHRONOUS MOTORS 3-Ph., 60 Cy.

HP	Volts	Make	Type	RPM
400	440/220	G.E.	ATI	600
300	2200/400	G.E.	TS	720
300	440/220	G.E.	ATI	600
300	440/220	Whse.	HB	277
250	440/220	G.E.	ATI	600
250	4000/2300	El. Mchy.	Syn.	600
240	2300/440	G.E.	ATI	720
200	6150/2300	Whse.	CI	1800
120	440/220	G.E.	ATI	900
110	440/220	G.E.	TS	257
100	440/220	Whse.	G	1800
75	2200/440	Whse.	GE	600

PLATING UNIT

1—5,000 amp., 4/6 volt (or 2,500 amps., 8/12 volts) A.P. Munning, double commutator dir. conn. to 50 hp. G.E. sq. cage motor.

CIRCUIT BREAKERS

2—2000 amp., GE E, 3 pole, 600 v., air
2—1600 amp., ITE, 3 pole, 600 v., air
2—1200 amperes, Whse., 3 pole, 600 v., air
1—400 amp., 37500 V., G.E., Type FHKO-236 outdoor type, high interrupting capacity.

SQUIRREL CAGE MOTORS

HP	Volts	Make	Type	Speed
650	440	G.E.	PT	3600
500	2300/4000	Elliot	ST	1800
350	2200	G.E.	KT	1200
300	2200	G.E.	PT	3600
250	440	G.E.	IK	720
250	2200	Al. Chal.	AR	1800
200	2200	G.E.	K	900
200	440	G.E.	IK	720
200	440	G.E.	IK	514
200	440/220	Whse.	CS	1200
200	440/220	G.E.	KT	1800
150	440	Multi sp.	KT	1800/600
150	440/220	Whse.	CS	900
150	440/220	G.E.	IK	450
150	2200/550	Whse.	CS	900
150	440/220	G.E.	KT	720
150	440/220	Howell	B. Brg.	1800
150 vert.	440/220	G.E.	KTP	1200
150	440/220	G.E.	IK	514
150	2200/440	G.E.	KT	600
150	2200/440	G.E.	K	1200
75 (5)	550	G.E.	KP	1800

A. C. GENERATORS

1—320 kva. 600 rpm, 2300/440/220 V., G.E.
1—275 kva. 1200 rpm. 440 V., G.E.
1—250 kva. 720 rpm.,2300/440 v., G.E.
1—225 kva. 600 rpm. 220/440 v., G.E.
1—187 kva. 1200 rpm. 440 V., Whse.
1—150 kva. 900 rpm. 480/240 v., G.E.
1—100 kva. 720 rpm. 440 v., G.E.
3— 75 kva. 1800 rpm. 480/240 v., Whse.

D. C. MOTORS

HP	Volts	Make	Type	Speed
250	230 (2 new)	Cr. Wh.	CMC	1800
225	230	G.E.	CD	650
150	230 (2)	Whse.	SK	850
125	230	Whse.	SK	550/1050
100	230	El. Dyn.	30-3	475/1250
100	230	Cr. Wh.	CMC	625
100	230	G.E.	CD	1750
75	230	G.E.	CD	1150
75	230	Whse.	SK	850

MOTOR GENERATOR SETS

1—350 kw, 1200 rpm, 250 V., Whse., conn. to 375 HP, 1200 rpm, 2300 V., syn.
1—175 kw, 1200 rpm, 230 V., G.E., conn. to 250 kva, 1200 rpm, 2200/440 V., syn.
1—100 kw, 1200 rpm, 240/120 V., Al. Chal., conn. to 150 hp, 440 V., sq. cage.
1—75 kw, 125 v., 1200 rpm, G.E. conn. to 120 hp, 2200/400 v., syn. motor.
1—65 kw, 1200 rpm, 250 V., G.E., conn. to 100 hp, 1200 rpm, 440 V., synchronous.
1—50 kw, 250/125 V., 1200 rpm, 3-wire, G.E., conn. to 75 hp, 440/220 V., sq. cage.

TRANSFORMERS 60 CY.

3—333 kva, G.E., 13,200—2300 V.
1—300 kva, Al. Chal. 4600/4100—240/120 V., 3 phase
3—250 kva, G.E., 2400-480 volts
3—250 kva, Whse., 11,000/22,000—2300 V.
3—200 kva, Whse., 2400—240/120 V.
1—150 kva, Whse., SK, 12200-125/215 v., 3 ph.
3—150 kva, Al. Chal., 2400-240/120 V.
3—150 kva, Whse., 2400-240/480 V.
3—100 kva, Whse., 2400-240/480 V.
6—100 kva, Whse., 2400—120/240 V.
3—100 kva, G.E., 4150—120/240 V.
2—100 kva, Whse., 2400—120/55 V.
3— 75 kva, Whse., 2400—240/480 V.
3— 75 kva, Moloney, 4150—240 V.
6— 50 kva, G.E., 2400—120/240 V.
11—50 kva, Whse., 2300-110/220 V., dry

STEPHEN HALL & CO.

HARRY J. RICE PRES.

458 SEVENTH ST. HOBOKEN, N. J.

STEAM POWER PLANT

5—714 HP Combustion Engineering WATER TUBE BOILERS, with Ebasco Superheaters, Sturtevant High Pressure Economizers, Green Chain Grate Stokers, Hagan Combustion Controls, Copes Feed Water Regulators, Clarage Forced Draft Fans, Sturtevant Induced Draft Fans, Smoke Stacks. Good for 250# pressure by Hartford.
1—705 HP Stirling 4 drum Boiler with B&W Superheater, Green Chain Grate Stoker, Sturtevant Economizers, Sturtevant Induced Draft Fan, with Smoke Stack. Good for 250# pressure by Hartford.
2—8000 HP Webster Water Heaters.
1—McCaslin Pivoted Bucket Conveyor System for handling coal and ashes. Approximately 300' long.
6—Steel Coal Bunkers, 80 tons each.
1—30" Wheeler Single Stage Circulating Pump, 30,000 GPM direct connected to 500 HP Allis-Chalmers Motor, 3/25/440, 900 RPM. (Has extra impeller for 15,000 GPM)
1—4"x8" Dayton-Dowd Centrifugal Pump direct connected to 125 HP General Electric-Curtis Steam turbine.
1—100 KW General Electric 125 Volt DC Generator direct connected to a General Electric-Curtis Steam Turbine, 2-stage with reduction gear, Type SG, 7600 to 1200 RPM.
1—Type 1A-60 Wheeler Turbo Air Pump direct connected to 75 HP General Electric-Curtis 2-Stage Steam Turbine, 1750 RPM.
1—6" Wheeler Centrifugal Condensate Pump direct connected to a 20 HP General Electric-Curtis 2-stage Steam Turbine, 1800 RPM.
1—Combination Circulating Pump and Condensate Pump driven by 100 HP General Electric single Stage Steam Turbine through a Westinghouse Reduction Gear, 3500 to 700 RPM.
1—2" 7-stage LeCourtney Centrifugal Pump, 200 GPM 650' Head at 3700 RPM direct connected to 55 HP Westinghouse Steam Turbine.
1—3000 KVA General Electric Synchronous Converter, Type HCC, 6 phase, 25 cycle, 250 RPM, 600 Volts DC with 1-3150 KVA General Electric Transformer 3 phase, 25 cycle, 6600/13200-445 Volts with starting panel and all instruments.
1—1000 KVA General Electric Synchronous Converter, Type HCC, 6 phase, 25 cycle, 750 RPM 600 Volts DC with 1-1050 KVA General Electric Transformer, 3 phase, 25 cycle, 13200/445 volts with starting panel and instruments.
1—500 KW Westinghouse Synchronous Converter, 6 phase, 60 cycle, 1200 RPM, 600 Volts DC with starting panel and instruments.
1—4000 KVA Westinghouse Transformer, 3 phase, 25 cycle, 13200/6600 volts.
7—700 KVA Westinghouse Transformers, single phase, 25 cycle, 7620/6600 volts to 13200 volts.
1—Kennecott Pressure Type Industrial Water Filter.
1—50-Ton Electric Traveling Crane—35'5½" Span.

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AUTOMATIC CAR DUMPER, Link Belt, will dump standard R.R. gondola cars up to 90 tons capacity, transfer table 54 ft. Specifications and photos available.

OVERHEAD ELECTRIC TRAVELING CRANES: 2—Shepard Niles 7½ ton, 80' span, 4 motor, bucket operating, cage control, 440 volt, A.C. Now operating, 30 day delivery, condition guaranteed.

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150 KW AC Gen. w/Skinner Unaflow Engine
250 & 200 KW AC Gens. w/N.R. Corl. Engines
500 HP, 600# Water Tube Boiler—1946
30 HP Cleaver Brooks Package Boiler
500—200—150—100—75—40 KW Motor Gen. Sets
150 KVA 240 V. Diesel Electric Set
100,000 Gal. Water Tank on 125' Tower
2—6'x150' Steel Stack—Excellent

H. & P., 6719 Etzel, St. Louis 14, Mo.

TURBINE GENERATOR SETS

1— 50 KW, West., DC, 120 Volts, 1200 RPM
1—100 KW, G.E., AC, 60/220 Volts, 1200 RPM
1—250 KVA, Elliot, AC, 3/60/220 Volts, 1200 RPM
2—200 KW, G.E., AC, 3/60/220 Volts, 1200 RPM

DIESEL GENERATOR SETS

2— 15 KW, Cat. Diesel, 3/60/120-208 V 1200 RPM
1— 50 KW, Cat. Diesel, 3/60/120-208 V 900 RPM
5— 50 KW, Intl. UD 18, 3/60/120-208 V 1200 RPM
1— 90 KW, Cummins, 3/60/240 Volts, 1800 RPM
1—100 KW, Buckeye, 3/60/2400 Volts, 400 RPM

SLIP RING MOTORS—3 Ph., 60 Cy.

1	40	**Al. Chal.	440	B. Brg.		900
1	50	West.	220	CW		1175
1	60	West.	220	CW	766A	870
1	500	G.E.	2300		17B	900
1	*600	West.	440	CW	432D15	1800

SYNCHRONOUS MOTORS—3 Ph., 60 Cy. With Direct Connected Exciters

1	75	El. Mach.	220			1200
2	125	**El. Mach.	4800			900
15	135	***G.E.	4000	TS	963Z	1200
1	*200	**El. Mach.	208			1200
1	*300	**El. Mach.	208			1200
1	350	**El. Mach.	208			1200

NEW G.E. AC GENERATORS W/PANELS

100—3 KW 3/60/120—208/1800 RPM
50—10 KW 3/60/120—208/1800 RPM

*NEW—**BALL BEARING—***SEP. EXCITER

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1—7" x 6' inverted accumulator, Mf's. by Chas. Eames Eng. Wks. 37" dial shell. Takes 11,000# ballast for 300# W.P. Max. Work. Height 15'-11". 2" pipe conn. to spindle, new 1943.

2—Worthington. 4½" x 6" vert. triples single acting pumps. 300# P.S.I., motor drive, less motrs., bronze trimmed, new 1943.

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Two 250 HP B. & W. Water tube boilers, now in operation under Hartford Inspection at 100 pounds. All pipe, valves, and accessories included with 150 ft. steel stack. Available immediately.

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PUMPS—COMPRESSORS—BLOWERS

1—2000 GPM 350' Pump with 240 HP Turbine
1—750 GPM 231' Pump with 75 HP 3 ph. motor
2—675 GPM 428' Pumps with 125 HP Turbines
2—600 GPM 360' Pumps with 72 HP Turbines
1—200 GPM 556' Pump with 50 HP 3 ph. motor
1—200 GPM 556' Pump with 50 HP Turbine
1—1100 GPM 220' Al.-Ch. Cent. Pump
4—2000-5000 GPM 32'-65', 10" & 12" Pumps
1—1000 GPM 280' all-bronze Cent. Pump
1—Kinney unused 6" Rotary Pump
1—Blackmer 6" Rotary Pumps 500 GPM
3—750 & 1000 GPM Knowles Steam Fire Pumps
1—Bench-Russ Vacuum Pump, 28 CFM
1—8" x 10" & 1—7" x 10" Triplex Pumps
1—3" & 6" Galland Hydraulic Triplex Pump
1—6" x 10" Gardner Duplex Pump 300 GPM
1—12" x 14" Duplex Air Compressor 850 CFM
1—12" x 10" 1-R Air Compressor 350 CFM
2—12" x 9" Worth. Comp. 375 CFM, Vac. & Press.
1—4-stage Norwalk Compressor 28 CFM 5000 PSI
1—Sturt. 60 H.P. Turbo-Blower 7000 CFM 29 oz.
1—G.E. 60 H.P. 220 volt Compensator
1—GE 2-stage Turbo Blower 3000 CFM 16 PSI
1—Spencer 50 H.P. Tur. Blower 4000 CFM 16 oz.
1—60 H.P. DC 230 v. 1150 RPM comp. C-W Motor
1—50 H.P. DC 230 v. 1750 RPM ball.-bear Motor
10—Nash Vacuum Pumps and Vac.-Heating Units
250—Rebuilt Motors 1—200 H.P.
75—Exhaust Blowers, Fans, Unit Heaters
1—C-H 50-60 HP 220 V. DC Mag. Starter

HUNDREDS OF OTHER ITEMS—ALL SIZES—ALL MAKES

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MOTORS—M. G. SETS—TRANSFORMERS

ENGINEERED AND REBUILT BY EXPERTS IN OUR OWN PLANT

SQUIRREL CAGE MOTORS

3-Ph., 60-Cy.

Qu	HP	Make	Type	Volts	RPM
1	400	Cont.	NZ-806	2300	1200
1	400	G.E.	IK	2200	514
1	400	G.E.	KT-412	2200	435
2	300	Whse.	CS-890	2300	1780
1	200	Whse.	CS-873C	2200	1160
1	200	Al.Ch.	AR	440/220	580
2	125	Al.Ch.	AR	2200	1750
1	125	Whse.	CS-761C	440/220	1750
1	125	C.W.	128-Q	440/220	430
2	100	Whse.	CS-663C	440/220	1750
1	100	Al.Ch.	AR	550	690
1	100	F.M.	H241B	440/220	435
1	100	Whse.	CS-938	2200	495
1	78	G.E.	I-K15	440/220	570
1	75	Al.Ch.	AR	2200	1765

MOTOR GENERATOR SETS

Qu	KW	Make	RPM	Volts DC	Volts AC
1	2400(3-U)	Al.Ch.	720	525	4800/2400
1	2400(3-U)	Whse.	720	600	4800/2400
1	1000 (—	G.E.	514	550	2300
1	1000(3-U)	Whse.	900	250/125	4160/2300
1	500	C.W.	720	250/375	2300/440
2	300	C.W.	720	575	2300/440
1	500(3-U)	Whse.	1200	250	440
1	250	Whse.	1200	125/250	2300
1	200	Whse.	1200	125/250	2300/440
1	200	Ridgway	900	275	2200
1	155	G.E.	720	250	2300/440
1	150	G.E.	1200	500	2300/440
1	100	Al.Ch.	2000	125/250	4000/2300
1	100	C.W.	1200	125	440/220
1	100	Delco	1200	125/250	440/220
1	100	Ridgway	1200	275	4000/2300
1	85	C.W.	1200	250	4000/2300
1	75	Star	1200	230	440/220
1	75	Al.Ch.	900	250	2300
1	75	Whse.	900	75	2200

We can furnish any of the above sets with exciters and VARIABLE VOLTAGE CONTROL engineered and rebuilt for your requirements.

SLIP RING MOTORS—CONSTANT DUTY

3-Ph., 60-Cy.

Qu	HP	Make	Type	Volts	RPM
1**	1800	G.E.	MT-498	2300	362
1**	1200	G.E.	MT-28	2200	275
2**	1000	Al.Ch.	ANY	2200	285
1**	600	G.E.	MT-20	2300	380
2	500	G.E.	I-15-M	2300	450
1	400	Al.Ch.	ANY	2200	514
2	400	G.E.	MT-412	2200	450
1	300	Al.Ch.	ANY	2200	514
1	250	Al.Ch.	ANY	440	720
1	250	G.E.	MT-414	2200	300
1	200	G.E.	I-15-M	2200	600
1	150	G.E.	I-13-M	2200	1750
1	125	Whse.	CW-870	2200	900
1	100	F.M.	H20C	440	900
2	100	G.E.	I-15-M	2300	514
1	75	Whse.	CW-7540	440	720
1	60	Whse.	C.W.	440	900
1	50	G.E.	MT-536	2200	1200

With the above we can supply manual or full magnetic control, standard or reversing, also with dynamic braking if required.

MOTOR GENERATOR SETS COMPLETE WITH CONTROLS STILL ON THEIR FOUNDATIONS AVAILABLE FOR IMMEDIATE SHIPMENT

(3) West., (4) G.E. 1,000 KW, 600 VDC Generators, compound, interpole, 514 RPM, 1440 HP., syn. motors, 11,000 v., 3 ph., 60 cy. (Will reconnect for 6,600 v.)

(3) G.E. 1,500 KW, 250 VDC, 514 RPM compound, interpole, poleface windings, 2,100 HP. syn., motors, .8 pf, 13,200 v., 3 ph., 60 cy. (Will reconnect for 6,600 or 4,160 v.)

Priced right for REMOVAL

SYNCHRONOUS MOTORS

3-ph., 60-Cy.

Qu	HP	Make	PF	Volts	RPM
1	6000	G.E.	100	2300	90
1	3000	Whse.	80	4800/2400	720
2	2100	G.E.	100	2300	360
2	1750	G.E.	100	2300	3600
1	1000	El.Mchy.	100	440	1200
1	750	G.E.	80	2300	450
1	250	G.E.	80	2300	514
3	250	El.Mchy.	80	440	600
1	187	G.E.	80	220/440	720
1	150	G.E.	100	2200	900
1	150	G.E.	100	550	600
1	150	G.E.	80	550	450
3	125	G.E.	80	4000/2200	1200
3	125	El.Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900

DIRECT CURRENT MOTORS

Qu	HP	Make	Type	RPM
1***	2000	Whse.	Encl.(Rev.)	600
1***	2400	Whse.	Encl.(Rev.)	600
4***	1500	Whse.	Encl.(Rev.)	600
4***	1200	Whse.	Encl.(Rev.)	600
4***	800	Whse.	Encl.(Rev.)	600
1	350	G.E.	CD-189-A	1150
1	300	Whse.		240/300
1	300/250	El.Dy	No. 22	400/1200
1	250	G.E.	MPC	325/975
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	180	G.E.	MPC	400
1*	150	C.W.	83-H	890
1***	125	Whse.	SK-190	600
2	125	Whse.	SK-184	575/850
1	90/160	G.E.	MPC	625/1125

All above 230-VDC except where marked ***.
***—Pedestal bearing mill design 525/600-VDC.
Rev.—designed for mill reversing service.
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TWO PRACTICALLY NEW WORTHINGTON CARBONDALE

REFRIGERATION COMPRESSORS

300 Ton — Freon

Ideal for large plant or office building

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WINSTON MACHINERY CO., INC.
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FOR SALE

18 NEW TURBINES

4 horizontal, 14 vertical, Westinghouse

Driving forced draft blowers—capacities ranging from 39000 to 56000 CFM and 16" to 24" pressure. Steam pressures 360 to 575#, back pressure 10#.
Will sell turbines separately if desired. *Price reasonable.*

Also—1—250 KW GE turbo generator unit, 3 phase, 60 cycle, 440 volt. Used one year.

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TRADE WITH BAUER

BUY - SELL - TRADE your COMPRESSOR — VACUUM PUMP, STEAM BOOSTER

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FOR SALE—NEW LOCOMOTIVE BOILERS

SUITABLE FOR STATIONARY USE

YOUR INQUIRIES INVITED

These boilers are from 2-10-0 Decapod Type Locomotives, fabricated by American Locomotive Co., in 1944-45. Specifications:

- WORKING PRESSURE ..... 200 Lbs.
- HEATING SURFACE ..... 2467 Sq. Ft.
- SUPERHEATING SURFACE ..... 670 Sq. Ft.
- FIRE BOX VOLUME ..... 275 Cu. Ft.
- Type HT-1 ..... Standard Stoker

Very Attractively Priced!

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TURBINE GENERATOR UNITS
3 Phase 60 Cycle

25000 KVA G.E. Cond. 250 lbs. 13200 volts.
21500 KVA G.E. Cond. 250 lbs. 2400 volts.
18750 KVA A.Ch. Cond. 200/400 lbs. 13200 volts.
5000 KVA G.E. Extr. Non-cond. 600 lbs.—125 lbs. Extr. 50 lbs. Exh. 13800 volts.
5000 KVA West. Extr. Cond. 400 lbs.—50 lbs. Extr. 600 volts.
5000 KVA G.E. Cond. 400 lbs. 2300/4000 volts.
2500 KVA West. Cond. 250/400 lbs. 2400/4160 volts, with surface condenser. 1946—Excellent condition.
1563 KVA G.E. Extr. Cond. 200/400 lbs—10/25 lbs. Extr. 2400/480, with surface condenser. New 1936—Excellent condition.
1250 KVA West. Cond. 450 lbs. 2400/4160 volts.
625 KVA G.E. Non-cond. 150/400 lbs.—50 lbs. Exh. 2300 volts.

ENGINE GENERATOR UNITS
3 Phase 60 Cycle

770 KVA Skinner Uniflow, 150 lbs. 2300 volts.
750 KVA Ames Vert. Uniflow, 150 lbs. 4160 volts.
625 KVA Skinner Vert. Uniflow 150 lbs. 480/240 volts.
312 KVA Skinner Uniflow, 150 lbs. 480/240 volts.

DIESEL GENERATOR UNITS
3 Phase 60 Cycle

1000 KVA DeLaVergne, 2400 volts, 200 rpm.
875 KVA DeLaVergne, 2400/4160 volts, 327 rpm.
700 KVA Fairbanks-Morse, 2400 volts, 300 rpm.
475 KVA Cooper-Bessemer, 2400 volts, 400 rpm.
300 KVA Worthington, 208-120 volts, 450 rpm.
250 KVA Worthington, 240 volts, 327 rpm.

GENERATORS
3 Phase 60/240 Cycle

7500 KVA G.E. 60 cy. 13800 volts, 720 rpm.
4600 KVA G.E. 90 cy. 2400 volts, 5400 rpm.
2859 KVA (3) G.E. 180/240 cy. 2300/4150 volts, 3600/4800 rpm.
2500 KVA G.E. 60 cy. 2400/480 volts, 3600 rpm.

STEAM BOILERS

100,000 lbs. per hr. Bodenhausen, 170/700 lbs. pulv. coal.
100,000 lbs. per hr. B. & W., 450 lbs., stoker coal.
50,000 lbs. per hr. B. & W., 420 lbs., pulv. coal.
30,000 lbs. per hr. B. & W., 435 lbs., gas or oil.
20,000 lbs. per hr. B. & W., 175 lbs., stoker coal.

TRANSFORMERS
60 Cycle

2,000 KVA (3) Penn. 1 ϕ, 33000-2400/4160 volts.
1,000 KVA (3) G.E. 3 ϕ, 12000-4160 volts.
1,000 KVA (3) West. 1 ϕ, 6900/11950-2300 volts.
833 KVA (3) West. 1 ϕ, 2400/4160-480 volts.
500 KVA (3) Mol. 1 ϕ, 44000-33000 volts.
500 KVA (3) West. 1 ϕ, 13800-2300 volts.
500 KVA (4) Mol. 1 ϕ, 19920/34500-2400 volts.
500 KVA (3) West. 1 ϕ, 33000-2300/4000 volts.
400 KVA (3) West. 1 ϕ, 33000-240/480 volts.
100 KVA (3) West. 1 ϕ, 33000-240/480 volts.

SYNCHRONOUS CONDENSER

7,500 KVA G.E., 3 phase, 60 cycle, 13800/6900 volts, 720 rpm.

INTERNATIONAL POWER MACHINERY CO.

1609 UNION COMMERCE BLDG. Telephone: MAin 1-9514 CLEVELAND 14, OHIO

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ALLIS-CHALMERS TURBO UNIT

TURBINE: 6000 KW, 3600 r.p.m., 200/225 lbs. I.S.P., 550° F.T.T., 2.5" Abs., Condensing.
GENERATOR: 8000 KW, 3600 r.p.m., 7500 KVA, 80% p.f., 3 phase, 60 cycle, 2300 volt.
EXCITER: 50 KW Turbo Unit, 125 volt, complete operating panel.
CONDENSER: Surface Type, 2 pass, complete with circulating, condensate and air removal pumps. Complete with auxiliaries.

GENERAL ELECTRIC TURBO UNIT

TURBINE: No. 27834, FORM GG, 3000 KW, Speed 3600, Steam Press. 200 lbs. 490° F.T.T., Exhaust Press. 2.5" Abs.
GENERATOR: A.C. No. 2000062, Type ATB-2, 3750 KVA, 3600 r.p.m. Form T, Amp 3600, Speed 3600, 60 Cycle, 600 Volts, 80% P.F.
CONDENSER: Alberger Surface, Size 10C, No. 11626.
Complete with auxiliaries.

GENERAL ELECTRIC TURBO UNIT

TURBINE: No. 28179, Form B, 1000 KW, 3600 r.p.m., 3 Stage, 195 lbs. Steam Pressure, 2.5" Abs.
GENERATOR: A.C., No. 4216999, Type ATB-2, 1250 KVA, 3600 r.p.m., Form H.T., 600 volts, Amps. ARM. 1203, 60 Cycle, 80% P.F., 3 Phase.
CONDENSER: Elliott-Ehrhart Surface type, 2650 sq. ft.
Complete with auxiliaries.

All above F.O.B. Foundations, South Carolina. Dealers will be protected.

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MOTORS!! PUMPS!! TRANSFORMERS!!

3—833 KVA Whse. transformers OISC, 1 ph., 2400/4160Y to 480 volt, Type SL, Serial 2150971-2-3
1—200 HP, 600 RPM, GE, Slipring IM, Frame 17, 3/60/220/440
1—150 HP, 514 RPM, Whse. Slipring, Type HF, 3/60/220/440
1—150 HP Al. Chal. Sq. Cage, 3/60/220/440/1200
1—150 HP Al. Chal. Sq. Cage, 3/60/220/440/1800
3—100 HP Whse. Sq. Cage Fr. 063-C, 3/60/220/440/1800
1—125 HP, 600 RPM, EM, Synchronous, 3/60/2200 Type BRKT
1—200 KW MG set, 125 V. DC, 900 RPM Syn. drive, 3/60/2300 EM Factory Set
2—24x24 Dayton Dowd Pumps, CS24, 16,500 GPM, 18.5/35 Ft. Hd., 360/450 RPM

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Good Used Boilers for IMMEDIATE SHIPMENT!

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SPECIAL VALUE! 1—277 ERIE CITY—3 Drum Low-Head 160 lbs. Oil Burners, Soot Blowers, Fans, Sus. Steel, Pumps, Stack. Ship in one piece. Used LESS THAN 3 MONTHS. IN Brooklyn Storage. IMMEDIATE DELIVERY! Less than ½ cost—No. 1011

PACKAGE TYPE

1—500 HP CLEAVER BROOKS Steam Package Generator 200 lbs. Late Model. Used only few months. Heavy Oil. Fine condition. No. 1019

We have other Boilers—all types and pressures—for prompt shipment. Send your Specs.

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(Used Equipment Dept.)
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MU 7-6547

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New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
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PEABODY OIL BURNERS FOR SALE

Two Peabody Wide Range Oil Burners with new boiler front for forced draft firing with direct motor drive Clarage fan and new Hays Combustion control. Will develop up to 500 Boiler Horsepower.

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LINER KITS—LINERS
PISTONS—RINGS—PINS
MAIN and CONN. BEARINGS—EXHAUST VALVES
INSERTS — GASKET SETS
LO and FO ELEMENTS
Prices on Request

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NEW YORK 6, N. Y.

3 PHASE TRANSFORMERS
2—1800 kva 6600/440 V. (7200-480 V.) 60 Cy. Gen. Elec. outdoor water-cooled Rated 1060 kva self-cooled.

OUTDOOR OIL CIRCUIT BREAKERS
1—600 A. 110 kv 250 mva GE FKO 138
1—600 A. 15 kv 500 mva West. F221
1—600 A. 15 kv Condit O1

OUTDOOR POTENTIAL TRANSFORMERS
7—33000/110 V. 200 V.A. Gen. Elec. Type EI16

TURBO-GENERATORS

1—6250 kva 500 kw 3600 rpm Allis-Chalmers 200 lbs. 100° SH condensing. Will operate 275 lbs. 615° TT without change. Generator 3/60/11500 can be changed to 2400/4160 V. Complete auxiliaries—can be operated for inspection. Checked by factory engineer in September 1951—no repairs required.

1—1567 kva 1250 kw 3600 rpm Allis-Chalmers 150 lbs. condensing. Will operate 200 lbs. 450° TT without change. Generator 3/60/2300. Complete auxiliaries.

1—1250 kva 100 kw 3600 rpm Westinghouse 185 lbs. 100° SH condensing. 3/60/2300. Completely reworked, generator has new winding. Complete auxiliaries.

1—937 kva 750 kw 3600 rpm General Electric 150 lbs. condensing. Generator 3/60/2300.

1—625 kva 500 kw DeLaval geared 5000/900 rpm 150 lbs. condensing. Generator 3/60/2300. Can operate 275 kw 10 lbs. BP without change.

1—187½ kva 15 kw Westinghouse geared 7200/900 rpm 150 lbs. 100° SH non-condensing. Generator 3/60/240.

1—125 kva 100 kw West. geared 7200/900 rpm 150 lbs. non-cond 3/60/240.

1—1500 KW 3600 RPM 3/60/2300 Gen. Elec. 140 lbs. non-condensing.

1—750 kw 3600 rpm 3/60/2300 Gen. Elec. 140 lbs. non-condensing.

1—500 kw 3600 rpm GE non-condensing 175 lbs. throttle 30 lbs. BP 3/60/2400.

BATTERY CHARGER
2—400 amp 42 volts Hertner M.G. set 3/60/220-440 with complete D.C. control and motor starter.

COMPENSATORS, A.C. AUTOMATIC
75 hp 3/60/2300 Cutler Hammer Bul. 9622 w/current limit, fuses. New
125 hp 3/60/2200 G.E. CR7051-H1A.

CONDENSERS
2—725 sq. ft. C. H. Wheeler 2 pass surface. New

COMPRESSORS, AIR
1000 CFM @ 225 rpm CP 2 stage 20"x12"x14" short center belt drive.

DIESEL GENERATORS
250 kw 400 rpm 3/60/220-440-2200 Superior YLO

ENGINE GENERATORS
2—65 kva 327 rpm 3/60/220 Engberg 9x10 vertical 175 lbs. non-condensing.

GASOLINE ENGINE GENERATORS
50 kw 1800 rpm 3/60/220 Waukesha-Bardco on wheels.

GENERATORS, A.C.
375 kva 225 rpm 3/60/220 Allis-Chalmers engine type
250 kw 1800 rpm 3/60/2200 Westinghouse ped. brgs.
200 kw 720 rpm 3/60 any voltage GE ped. brgs.

GENERATORS, D.C.
75 kw 1200 rpm 125 V. GE single brg.
20 kw 1200 rpm 125 V. GE CDM

MOTORS, SLIP RING
350 hp 360 rpm 3/60/2200 GE Type IM
200 hp 1800 rpm 3/60/2200 GE Type IE 138
200 hp 1800 rpm 3/60/440 GE Type IM
100 hp 900 rpm 3/60/440 GE Type MTC5346
100 hp 450 rpm 3/60/2300 G.E. Type I.M.
75 hp 1800 rpm 3/60/2200 Westinghouse C.W.
2— 75 hp 720 rpm 3/60/2200 Westinghouse HF
50 hp 720 rpm 3/60/2200 GE Type MT552
50 hp 900 rpm 3/60/2200 GE Type IM

MOTORS, SYNCHRONOUS
400 hp 1800 rpm 3/60/2200 Westinghouse ped. brgs.
290 hp 720 rpm 3/60 any V. GE Type ATI ped. brgs.
125 HP 1800 rpm 3/60/2200 Fairbanks-Morse with dir. conn. exciter.

MOTOR-GENERATOR SET
100 kw 600 V. 514 rpm Westinghouse 1440 hp any voltage syn. motor

PUMPS, BOILER FEED
750 gpm 450 lbs. 3600 rpm Gaulds 3360 4"—4 stage
475 gpm 750 lbs. 3600 rpm Gaulds 3300 3"—6 stage
2—150 gpm 230 lbs. 2750 rpm Frederick steam turbine

INDOOR OIL CIRCUIT BREAKERS
9—1200 amp 15 KV Westinghouse CO-11 De-Ion Grid 500,000 KVA 125 v. D.C. solenoid indoor
1—2000 amp 15 KV Westinghouse CO-11 De-Ion Grid 500,000 KVA 125 v. D.C. solenoid indoor
2—600 amp. 15 kv 130,000 kva West. Type B-20 indoor
10—400 amp. 15 kv 130,000 kva West. Type B-20 indoor

TRANSFORMERS, 60 CYCLES
2—100 kva 13800/2300 V. 1 Ph. GE Type H Form VDDJ
3—75 kva 2400-4160/240-480 V. 1 Ph. GE Type H Form KF
3—37½ kva 2400-4160/120-240 V. 1 Ph. GE Type H Form K
121—10 kva 2400-4160/120-240 V. 1 Ph. Various Makes—all modern
20—7½ kva 2400-4160/120-240 V. 1 Ph. Various Makes—All modern
36—5 kva 2400-4160/120-240 V. 1 Ph. Various makes—all modern

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BOILER FEED PUMPS

2—A.-Ch. 480 G.P.M., type ML, 6 stage, size 5 x 4, 1614 Ft. Hd.
1—Worth. 740 G.P.M., type WCS-2, 5", 2250 Ft. Hd.
1—Worth. 700 G.P.M., type UNS-1, 6 stage, 6", 1550 Ft. Hd.
2—I. R. 200 G.P.M., 2", 1375 Ft. Hd.
Pumps above are mounted on basis for motor or turbine drive.

We have about 200 various size cent. pumps on hand, turbine, motor, and gasoline driven. Send us your inq.

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2829 Cedar St. Phila., 34, Pa.

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ALL SIZES — TYPES — PRESSURES — *A few of our offerings*

1—250 H.P.—225# W.P.—Keeler "CP" Type Package Boiler—New 1945—used 1 year—Complete with forced and induced draft fans with Thermi Stack—all controls—Superheater.
1—250 H.P.—200# W.P.—Keeler straight tube type boiler, with superheater, forced draft fan and stack, stoker fired, all controls etc.
1—250 H.P.—250# W.P.—Wickes Boiler (Bent Tube) stoker fired, with superheater and forced draft fan, stack, all trim and controls.
ALL BOILERS ASME AND NATIONAL BOARD CODE.
1—50,000 lbs. per hour sectional steel header watertube Boiler, 275 P.S.I.
2—500 H.P. sectional steel header watertube Boilers, 250 P.S.I.
1—1000 KW Condensing Turbo Generators
2— 300 KW Condensing Turbo Generators
1—1000 KW non condensing Turbo Generators
1— 150 KW Gasoline Engine Generator Set.

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in excellent Condition

Non-Condensing, Steel case 80# back pressure .8 P.F., 3 phase, 60 cycle, 4150/2300 volts, alternating current, complete with accessories, switchboard, oil circuit breaker and direct connected exciter. Only operated alternately for six years. Ideal for Chemical, Rubber, Petroleum, Textile, Pulp and Paper, and Sugar Refining Industries.

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We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

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ELECTRICAL CABLE

- For every Industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular suppliers.
- Cut to length. Reasonably priced.

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STEAM SUPERHEATER

AVAILABLE FOR IMMEDIATE DELIVERY
One No. 1 Combustion Engineering portable, Elesco type, separately fired steam superheater. Unit furnished complete with gas burner. Heater designed to handle 500 lbs. per hour of steam at 110 psig at 125°F superheat.
DOUBLE-KAYE PLUMBING SUPPLY CO., INC.
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NEW LEATHER BELT

1—Heavy 3 PLY LEATHER GENERATOR BELT, 38" wide 57'10" long plus laps for cementing on JOB.
Purchased last year, NEVER UNWRAPPED.
MAY BROTHERS, GARDEN CITY, LA.

TRANSFORMERS

60 Cy. Single and 3 Phase

KVA	Make	Voltages Pri. Volts	Sec. Volts
6000(1)	Am. Br. Bov.	2400	5040/4800Y
3750(1)	Uptegraff	22000	600
3750(1)	Uptegraff	22000	440
3000(1)	Uptegraff	22000	440
3000(1)	GE	22000	480
3000(1)	Uptegraff	22000	550
2500(3)	West.	27600	2300
1250(3)	GE	33000/11000	2200
1000	West.	2286	220
833(2)	GE	13800	460
833(3)	West.	2300	575
800(3)	GE	22000	2300
750(4)	GE	2200	244/488
667(2)	GE	13200	2300/4000
667(1)	Al. Ch.	13200	480
500(2)	GE	11000	2300
500		4600	460
500(6)	GE	33000	6600/2300
600(6)	GE	6640/11500Y	75/120
450	Uptegraff	11000	460
450(1)	Uptegraff	11000	220
400(3)	GE	2200	244/488
333(1)	GE	22000	2200
333(3)	GE	22000	2200
333(1)	GE	22000	2300
333(2)	GE	11500	115/230
333(3)	GE	11000	2200
333(3)	West.	2400	120/240
300(3)	West.	14520	660/230
300(1)	Pitts.	6600	110
300(3)	Pitts.	2300	115/230
300(2)	GE	2300	115/230/460
250(1)	GE	2400	240/480
250(3)	Mol.	34500	2300
250(3)	GE	2400	240/480
250(1)	Wag.	2200	440
250	West.	468	
200(3)	West.	26400	267
200(4)	West.	13800	278
200(3)	West.	13200	2300
200(3)	Al. Ch.	33000	220/440
200(3)	L.M.	7200	120/240
200(2)	Pitts.	12000	115/230
200(3)	Wag.	2300	230/115
200(3)	GE	2400	120/240
200	GE	486	120/240
200	GE	2200	122/244
200	West.	2300	600
200	GE	11500	460
200	West.	3984	115/230
200	GE	6900	2400
150(1)	West.	6900	120/208
150(3)	West.	14400	600
150(3)	West.	14400	575/230
150(4)	GE	12000	115/230
150(1)	West.	2400	480
150(4)	Packard	4600	230/115
150	GE	2400	240/480
150(3)	GE	2200	110/220
150(3)	Pitts.	7200	115/230
150(3)	GE	4150	120/240
100(4)	Penn.	600	120/240
100(3)	GE	14400	2400/4800
100(2)	Al. Ch.	4600	230/115
100(2)	West.	13200	220
100(4)	Al. Ch.	2400	480
100(2)	Pitts.	2300	230/460
100(1)	West.	2300	230/115
100(4)	Al. Ch.	2300	230/115
100(1)	GE	2300	230/460
100(7)	GE	1980	220/440
100(2)	GE	1100	220/440
100(3)	Pitts.	4600	230/115
100(3)	GE	460	115/230
100	GE	11500	230/460
100	GE	11000	2300
100	GE	2400	120/240

WE STOCK 1200 UNITS 5 TO 75 KVA.

MOTORS • GENERATORS
TRANSFORMERS
25 cy. 60 cy. D.C.

ALL VOLTAGES
1-1500 H.P.

NEW and REBUILT
BOUGHT and SOLD
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

1—400 H.P. Keeler C.D. Integral Type Water-tube Boiler with complete Tood Oil Burner Installation. Design Pressure 160#. Built 1940.

1—350 H.P. Cleaver-Brooks, 150# pressure. No. 6 oil. Complete with pumps and receiver set. All trim.

1—600 H.P. B.&W. Sect. Header Boiler, 200#.

1—150 H.P. Bros 150# w.p., 3 drum, Bent tube, self contained, steel encased, brick lined. 9000# steam per hour.

2—500 HP Springfield Sec. Hdr. Cross Drum 250 lbs. Superheaters, etc., (1934)

1—490 HP Walsh-Weidner sec. Hdr. Cross Drum. 450 lbs. Superheater, etc.

2—604 HP B&W. Sec. Hdr. Long Drums 225 lbs. Superheaters, etc.

1—615 HP Springfield sec. Hdr. Cross Drum. 275 lbs. Superheater. Stoker.

2—854 HP Springfield Sec. Hdr. 225 lbs. Superheaters, etc.

2—250 HP Erie City—3 Drum lowhead. 200 lbs. —a complete Plant. 1946. 200# w.p. fully automatic mechanical Peabody burning equipment. 2—Pratt-Daniels Stacks, pumps and heaters. Pressure parts move intact as unit.

2—310 HP Keeler "CP" Self-Contained. 160 lbs. With or without STOKERS. Complete Plant.

2—Babcock & Wilcox FF-15 Self-contained 160 lbs. Complete Plant—16,000 lb. each.

2—750 HP B&W Sterling, new tubes, 1923 225# w.p.

1—125 H.P. Erie City Economic, 125# pressure. Complete with stack and trim.

Miscellaneous Scotch Marine Boilers, 75 to 150 H.P. available.

A Number of Self-Contained & Economic Units, 50-150 H.P., 100-200 Lbs. Pressure.

2—Detroit Roto-Spreader Stokers for 300 H.P. Boilers, nominal rating.

Combustion Engrg., Spreader Stoker complete with fan & Hogan Controls-Stoker. Designed for 600 H.P. boiler at 200% of rating, or 1200 H.P.

1—6 Cylinder Enterprise Diesel 800 H.P. direct connected to 1000 K.V.A., 3 ph., 60 cyl. 2400 V. Elliot Generator complete with all aux. Unit built 1948, 1400 hrs. use only.

1—750 K.W. and 1—500 K.W. DC 240 V Generators dir. conn. to 2—Westinghouse non-cond. Turbines—3600 r.p.m. reduced to 900 r.p.m. on generators. Includes switchboards.

1—250 H.P. Cleaver-Brooks, 15# w.p., #6 oil, Built 1946.

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SURPLUS STEEL STORAGE TANKS
39 HORIZONTAL 10,000, 15,000, 20,000 & 25,000 GAL. CAP.
42 VERTICAL 3000, 5000, 10,000, 35,000, 55,000 & 80,000 BBL. CAP.
LESTAN CORP., Rosemont, Penna.

Turbo Generators, Boilers, etc.

4000 KW Conds. 275#. Extraction 30#.
3125 KVA Non-Cond. 400#g. 35# exhaust.
3000 KW Non-Condensing — Extraction 425#g. 60# exhst. 170# extrac.
100,000# per hr. B&W 250# Intgr. Furnace.
100,000# per hr. B&W 450# Sterling.
87,000# per hr. 350# Steam Generator.
also
3500 KW GENERATOR 2300v. 3600 RPM.
TRANFORMERS—DIESELS ELECTRIC.

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Electrical supplies, tools, wire and cable, high voltage gear, telephones, transformers, motors, control, portable cable, 150-1500 watt floodlights, test equipment, 400 KW diesel, new Ford Power units, all from Harlan Dam a $40,000,000.00 job. Rock bottom on new and used.

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REBUILT POWER EQUIPMENT—READY TO SHIP!

IMMEDIATE DELIVERY AIR COMPRESSOR

876 cfm Chicago Pneumatic 100 lb. pressure 2300 or 440 v. A.C. syn. motor complete with starting equipment.

TRANSFORMERS—1 Ph. 60 Cy.

No.	KVA	MAKE	PRIM.	SECONDARY
4	15	G.E.	2200	110/220
10	25	G.E.	2200	110/220
3	25	West.	2200	110/220
1	30	G.E.	2200	110/220
9	37½	G.E.	2200	110/220
2	40	G.E.	2200	110/220
11	50	G.E.	2300	110/230
3	50	West.	2200	110/220
3	75	West.	2400	120/240
1	75	West.	13200/6600	2300
1	75	Pgh.	4600	115/230
1	100	Pgh.	2300/4600	115/230
6	100	Pgh.	4600	115/230
1	100	West.	2300	230/460
2	150	Pgh.	4600	115/230
1	150	G.E. (3 Ph)	2200	240/480
3	200	All. Chal.	22000	2300
3	200	Pgh.	23000	460
2	250	G.E.	2400	460

FOR SALE or RENT

SPECIAL BARGAINS

DIESEL ENGINE GENERATOR SETS

4—100 KW., 120/240 V. D.C. Delco Generators dir. con. to 150 HP., Model GBD-5, 6½ x 7, 8 cyl., Superior Diesel Engines, elec. start, power panel, accessories. Practically new—only used for spares.
West. Gen. dir. con. to 150 HP. Superior Diesels same as above.

1—96 kva. Fairbanks Morse 220/440 V. 3 ph. 60. cy., 380 rpm. DIESEL.

1—37½ kva. 3 ph. 60 cy. 127/220 v. or 220/440 v. 1200 rpm., Century A.C. Generators with dir. con. exciters driven by 70 HP., 4 cyl. Model UD-14 International Harvester DIESEL Engines with panels.

17—7½ KW., 120 V. 1 ph., 60 cy. Continental Gas Engines.

2—New 5000 Watt—115/230 V., 1s, 60 cyl. Wisconsin Gas Engines.

PLATING & WELDING SETS

1—48 kw. 6000 amp. @ 8 volt, 3000 amp. @ 16 v. Electro Products D.C. Generator double commutator, dir. con. to 75 HP., 220 v. 3 ph. 25 cy. Syn. A.C. Motor.

3—93 kw. G.E. type CD-1231, 62½ v. 1500 amp. Welding Generators each mounted on base with 135 HP, 3 ph. 60 cy. motors.

MILL MOTORS—230 V. D.C.

4—30/40 HP., Westinghouse MC-50, 525/440 rpm tapered shafts both ends—totally enclosed roller bearings.

DC VARIABLE SPEED MOTORS 230 Volts

HP	MAKE	RPM	TYPE
400	All. Chal.	400/1200	
125	Westg.	125/500	RB Anti-Fric.
100	Westg.	500/1000	SP BB
75/150	G.E.	300/1200	CD-189 BB Enc
75/100	Westg.	600/1200	SA-13L BB
50	G.E.	600/1200	LC
50	Reliance	400/1200	T-985F TEFC BB
50	Reliance	300/1200	T1985T BB
50	Crkr. Whlr.	1200/200	CMC-8B
40/50	Reliance	500/1500	T-461T BB
40	Westg.	750/1200	SK-149
40	Al. Chal.	575/1150	E-145
40	Reliance	500/1500	T-461F TEFC BB
40	Reliance	400/1600	T-615F TEFC BB
40	El. Gen. Co.	385/1200	Frame 1096
35	G.E.	625/2100	COM-1839 AE
35	G.E.	350/1400	RF-162 BB
30/40	Imperial	400/1600	D-D69 BB DP
30/40	Reliance	300/1200	T-651 TE BB
30	Westg.	1150/1750	SK-133 TEFC BB
30	Reliance	400/1600	T-461F TEFC BB
30	Imperial	400/1600	D-D69 BB DP
25	Reliance	400/1600	T-810F TEFC BB

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Duquesne Electric & Mfg. Co. Pittsburgh 6, Pa.

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1—Unused Westinghouse 5000 kva 3φ complete 14,150 amps.

3—1000 kva Gardner 1φ with Reactors 1000 kva, 5500 amps each phase.

1—300 kva Gardner 1φ with 300 kva reactor, 1360 amps.

1—200 kva G.E. Pyranol unused 12000/240/120.

1—200 kva G.E. oil. 11,950Y 6900/460/230

1—200 kva bank 4160/460/230 oil. Hunts insp.

Some unused since rewound glass insulation.

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3—525 HP. 200# 4 Drum Sterling Type Water Tube Boilers. Stamped Ohio Standard. National Board. A.S.M.E. Code. H.S.B. and Registered. With no recommendations on Last Recent and Final Inspection Report. Boilers are Fired with 9 Todd "Duo-Press," with Vee-Cee Oil Burners. Drilled for Gas Rings. Has Fireye Steam and Electric Oil Pumping Heaters. Diamond Soot Blowers. Breechings. 2000 H.P. Cochrane Feed Water Heater. Oil Filter. Continuous Boiler Blow Off System. Flame Control. Smoke Density. Recorder, Pumps, 2—14,000 Gal. Oil Storage Tanks, Pumps, Coal Bunkers and Ash Conveyors, Etc.

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2—175 KW G.E. M-G SETS

175 KW, MPC, 275 V. DC—260 HP, TS 1200 RPM, 3 PH, 60 Cy., 2300/4150 V.
FACTORY BUILT — EXCELLENT CONDITION — IMMEDIATE DELIVERY

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One 250 H.P. ERIE CITY BOILER Economic Type 150 lb. W.P. Complete with Oil Burner, Stack, Pumps and all fittings. Call or write.

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FOR IMMEDIATE DELIVERY
TRANSFORMERS

3—200 KVA. General Electric OISC, Outdoor type transformers, Type H, Form KDD, single phase, 60 Cycle, High voltage 2300/4000Y—with 4—2½% taps below 2300; Low Voltage 230/460. Serial Nos. 3777462—63 & 64.

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LARGE EQUIPMENT

Air compressors, motor generators, diesel engines, overhead electric cranes.

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AC & DC Motors & Generators — Pumps — Transformers — Controllers — Oil & Air Breakers — Axial Fans — Diesel & Turbine Driven Equipment — Compressors — Overhead Electric Cranes.

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2000-3500 H.P. 2300/3/60 synchronous motor 225-275 RPM with starting equipment. Would consider slipring motor.

SOUL CLINIC, INC.
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BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES

No lengths too long or too short
TELEPHONE: EASTGATE 7-4778

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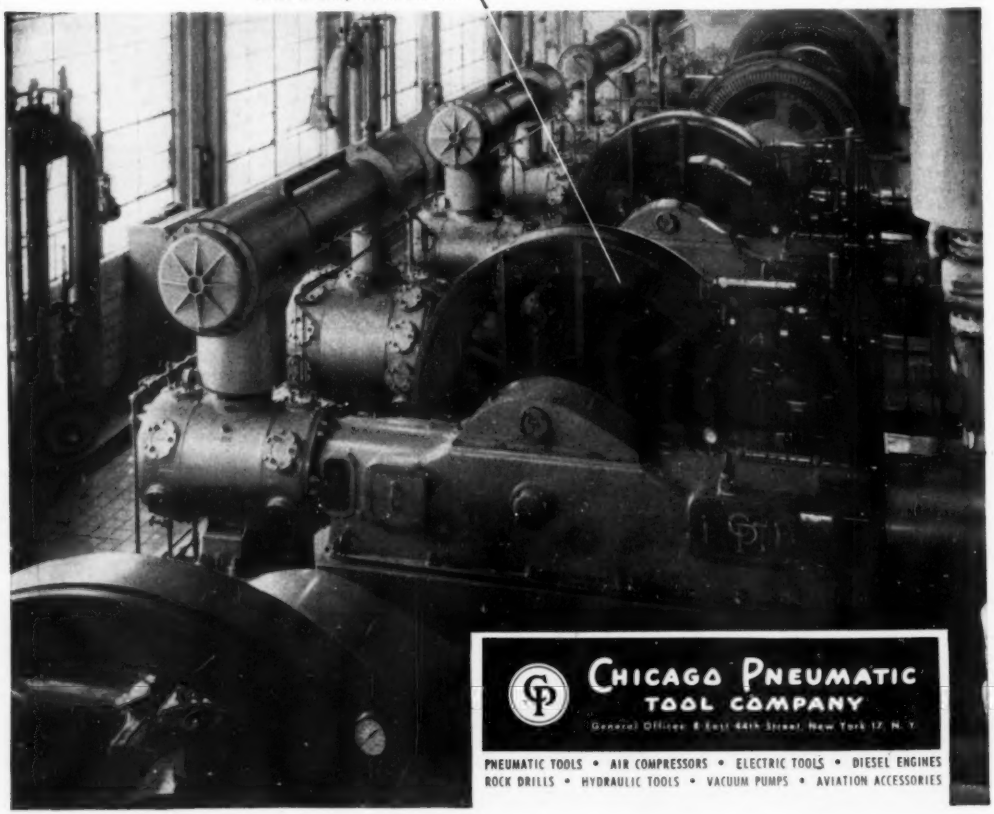

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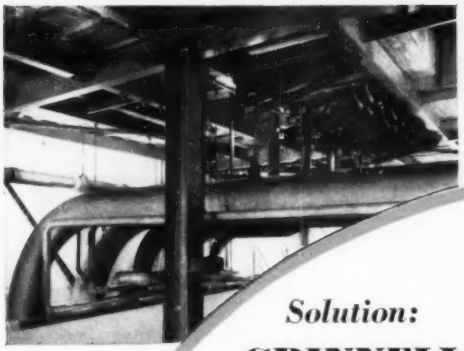

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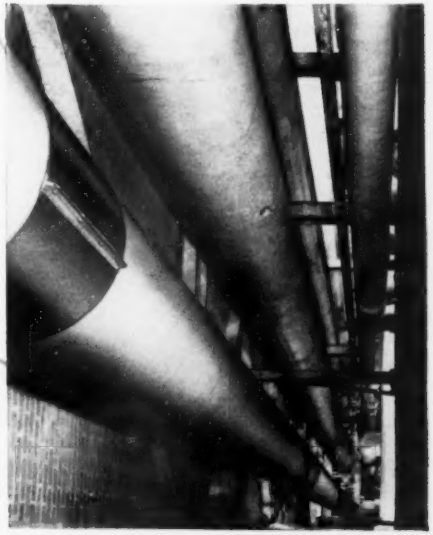

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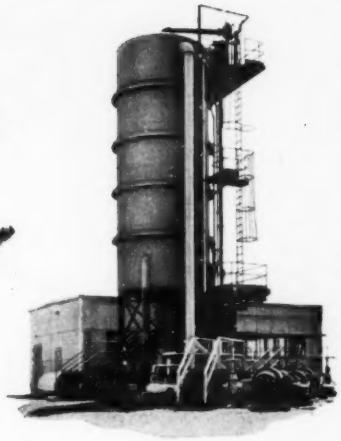

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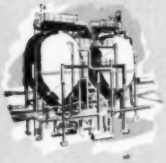

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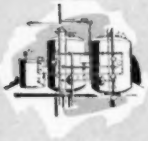

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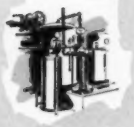

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